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

November 2, 1984

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:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

By letter dated September 10, 1984 from T. M. Novak to H. G. Parris, TVA was requested to respond to NRC concerns related to potential boron dilution events at Watts Bar Nuclear Plant. The enclosed response provides TVA's basis for compliance with the NRC staff position.

If you have any questions concerning this matter, please get in touch with D. P. Ormsby at FTS 858-2682.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 2nd day of Nov. 1984

Paulette H. White
Notary Public
My Commission Expires 8-24-88

Enclosure
cc: U.S. Nuclear Regulatory Commission (Enclosure)
Region II
Attn: Mr. James P. O'Reilly Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
BORON DILUTION

By letter dated February 24, 1983 from T. M. Novak to H. G. Parris, TVA was informed of the NRC staff's position on Boron Dilution Event Response for Watts Bar Nuclear Plant. This letter specified that the NRC did not believe that the audible count rate ticker was audible or discrete. By letter dated April 29, 1983 from L. M. Mills to E. Adensam, TVA stated its findings that the source range audible ticker is the most recognizable and distinct sound in the control room and could be adjusted to exceed normal comfort sound levels. TVA also stated its position that, because of the high flux at shutdown alarm, the source range ticker and visual chart recorders, adequate audible and discrete information was provided in the main control room to determine a boron dilution event. By letter dated September 10, 1984 from T. M. Novak, TVA was informed that the NRC still had concerns that the information available in the main control room may not be adequate. It was stated that, "The NRC staff has determined that the plant must have adequate alarms to alert the operator to the dilution event. Two alarms should be provided in the control room (e.g., two source range detector bistables, these may powered from different electrical sources, generally class IE-battery backed inverter power sources). The plant annunciator system is adequate for the alarms, i.e., it does not have to be a Class IE system. Seismic and environmental qualification need not be a design consideration."

TVA's previous explanation of the availability of the source range ticker, flow differential alarm and visual chart recorders was based on the premise that a single active failure could possibly result in loss of the high flux at shutdown alarm. This could have occurred since TVA would have been required to have only one source range channel operable as specified in previous versions of the draft technical specifications. The technical specification now proposed for Watts Bar would require two operable source range channels. TVA therefore meets the NRC requirements for redundancy as specified above.

The following information details TVA's compliance.

The source range high flux at shutdown alarm receives signals from two independent source range neutron channels (see FSAR figure 7.2-1). One detector and its associated instrumentation is powered from 120V AC vital instrument power board I. The other is powered from 120V AC vital instrument power board II. This power separation holds true for the separation relays. The annunciator alarm circuit is powered from 125V vital DC boards III and IV.

The redundancy of the high flux at shutdown alarm logic is shown in the generalized schematic in figure 1. With both source range channels operating, contacts 1B and 2B will be normally closed and contacts 1L, 2L, 1M, 2M, 1X, and 2X normally open. If source range detector 1 and/or 2 indicate a high flux at shutdown, contacts 1B and/or 2B will open, initiating the "Source Range High Flux Level at Shutdown" annunciator.

If the alarm signal from one source range channel is blocked from the annunciator, the other channel can still initiate the annunciator. If channel 1 is blocked, contacts 1B, 2B, 1L, and 1M will be normally closed. The closed 1M contact ensures that the operator is aware that a source range channel is blocked. Contacts 2L, 2M, 1X, and 2X will be normally open. A high flux indication in channel 2 will open contact 2B, initiating the high flux annunciator. The logic is similar if channel 2 is blocked and channel 1 indicates a high flux.

Contacts 1X and 2X close on manual block of the source range channel after the P6 permissive or P10 automatic source range channel block. The only nonredundant pieces of equipment for the high flux at shutdown alarm are the annunciator light, audible alarm, and alarm card.

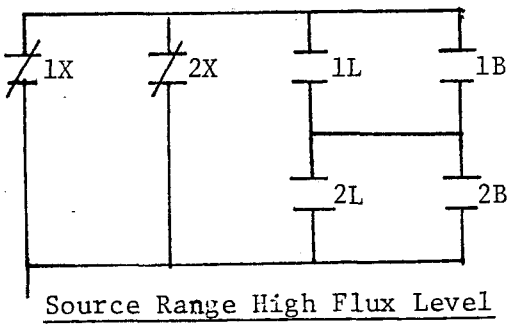
Availability of the source range channels and the high flux at shutdown alarm is ensured by the performance of Surveillance Instruction (SI)-3.1.8, "Source Range Neutron Flux-Channel Calibration," in accordance with the technical specifications once every 18 months. The channel calibration functionally tests all components of the source range channels and the alarm circuit.

The monthly performance of SI-3.1.9, "Source Range Neutron Flux Channel Functional Test," in accordance with technical specifications, provides additional assurance of the availability of the source range channel bistables.

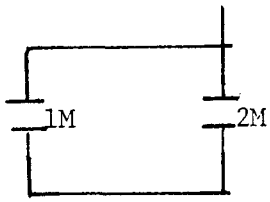
Operability of the high flux at shutdown alarm when needed is ensured by GOI-3A, "Plant Shutdown fromm Minimum Load to Hot Standby." Availability and operability of the nonredundant window, audible alarm, and alarm card are further ensured by Administrative Instruction (AI)-2.10, performed at each shift change. This is a test of the main control board annunciator panels. The only components of the alarm circuit not checked during the alarm test of AI-2.10 are a small number of static electrical componenets which form the bistable alarm input circuit on the alarm card. The probability of these components failing is very low.

In summary, the design of the source range high flux level at shutdown alarm is sufficiently redundant. The entire circuit is tested during the channel calibration every 18 months, the bistables are tested monthly, and the annunciator circuits are tested every shift. Since the Watts Bar design meets the NRC requirements as specified by the September 10, 1984 letter, no additional TVA action is required.

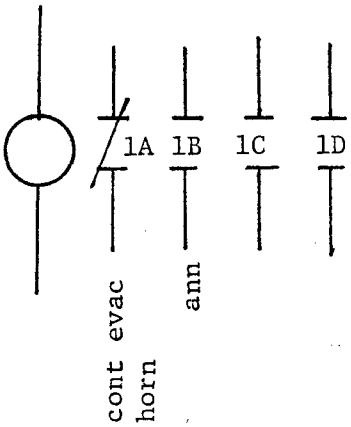
FIGURE 1
(All contacts shown de-energized)



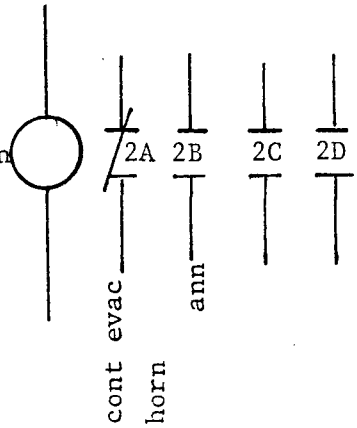
Source Range High Flux Level At Shutdown
(contacts open to annunciate)

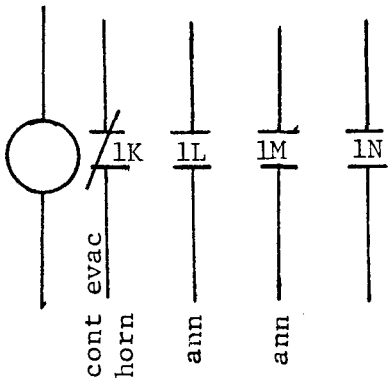


Source Range High Shutdown Flux Alarm Block
(contacts closed to annunciate)

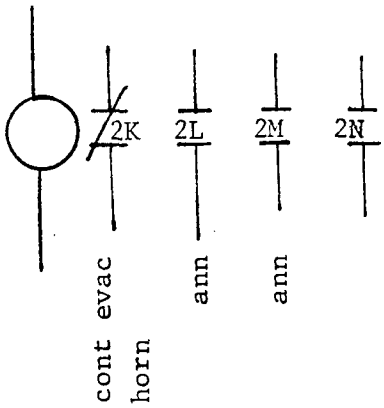


Source Range High Flux At Shutdown - Separation Relays
(energized when SR high flux at shutdown is zero)





Source Range High Flux Alarm Blocked- Auxiliary Relays
(energized for SR high flux at shutdown alarm blocked)



open contact

closed contact