



Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

MAR 19 2004

WBN-TS-03-03

10 CFR 50.90

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D. C. 20555

Gentlemen:

In the Matter of ) Docket No.50-390  
Tennessee Valley Authority )

**WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - TECHNICAL SPECIFICATION  
(TS) CHANGE NO. 03-03 - SOURCE RANGE NEUTRON FLUX REACTOR TRIP  
FUNCTION RESPONSE TIME TEST - RESPONSE TO REQUEST FOR  
ADDITIONAL INFORMATION (TAC NO. MC0485)**

The purpose of this letter is to provide TVA's response to an NRC request for additional information (RAI) received via email on December 1, 2003. This request for additional information involves TVA's amendment request dated August 22, 2003, which proposed the addition of Technical Specification Surveillance Requirement 3.3.1.15 to the Source Range Neutron Flux Reactor Trip function in accordance with Westinghouse Nuclear Safety Advisory Letter (NSAL) 00-016.

Subsequent to the receipt of the RAI, a teleconference was held on February 10, 2004, between TVA and NRC. As a result of this teleconference, it was agreed that TVA would provide the subject response.

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The enclosure to this letter provides TVA's response to each of the three questions. There are no regulatory commitments associated with this submittal. If you have any questions about this change, please contact me at (423) 365-1824.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 19th day of March 2004.

Sincerely,

A handwritten signature in black ink, appearing to read "P. L. Pace", written in a cursive style.

P. L. Pace  
Manager, Site Licensing  
and Industry Affairs

Enclosure

1. Response to Request for Additional Information

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cc (Enclosure):

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**ENCLOSURE**  
**WATTS BAR NUCLEAR PLANT, UNIT 1**  
**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

**Question 1**

1. In Westinghouse NSAL 00-016, in the section labeled "Safety Significance," the letter states: "it is reasonable to assume, based on start-up testing, that the original functional requirement allowance of 0.2 second for the analog/logic (0.5 second including the breaker opening and gripper release delays) was met and the analog/logic would not have degraded by more than a factor of three (to 0.6 second). The total trip time response including breakers and gripper release would then be less than 1.0 second."
- A. Please describe how the original functional requirement allowance of 0.2 seconds was determined.

**Response to Question 1A**

The functional requirement allowance of 0.2 seconds was based on the original Westinghouse design specification requirements for the equipment. Since other components in the trip signal path also introduce a delay in propagation of the trip signal, a maximum delay of 0.2 seconds for the signal processing electronics was specified so that the total delay for the trip function would not exceed the analysis limit of 0.5 seconds. Note that the Technical Specification requirements for response time verification apply to the function (reactor trip) - individual component response times are not specified. The Westinghouse source and intermediate range nuclear instrumentation was replaced with similar equipment provided by Gamma-Metrics prior to start-up.

- B. Please describe the equipment manufacturer's response time specification for this equipment.

**Response to Question 1B**

A response time value of 25.2 milliseconds for the trip channel (from the amplifier to the signal processing drawer output) was provided by the equipment manufacturer, Gamma-Metrics. An optical isolator in one of the two channels provides an isolated output to the Appendix R source range drawer and, based on manufacturer information, adds an additional delay to the response time of up to 120 milliseconds. Testing at WBN has shown that the isolator time delay is much less than 120 milliseconds.

**C. Please describe the start-up testing done to verify this functional requirement of 0.2 seconds.**

Response to Question 1C

Response time tests were performed during initial start-up to verify response time of the source range reactor trip function, although there was not a Technical Specification requirement for verification of the response time of this trip function. The tests were performed similarly to those for other reactor trip functions and involved a series of tests of the equipment required to produce a reactor trip, including the source range signal processing equipment, the Solid State Protection System logic, reactor trip breakers, and an allowance for control rod gripper release time. The acceptance criterion of 0.5 seconds for the source range reactor trip function was satisfied for both channels. The original functional requirement of 0.2 seconds was not considered an acceptance criterion. Consistent with the TS, response time verification requirements apply only to the total function response time as assumed in the safety analyses, not to the individual components. Nevertheless, the response time of the source range signal processing equipment was determined during start-up testing to be less than 0.1 seconds for both channels. The response time was determined by injecting a signal into the input of the wide range amplifier and measuring the time until a channel trip output was generated by the source range trip bistable. The response time of the trip function was determined to be significantly less than the acceptance criterion of 0.5 seconds.

**2. Please describe how the RTT will be performed on the source range neutron flux reactor trip function.**

Response to Question 2

As described in the TS Bases section B 3.3.1, response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the channel. WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests" (reference 12 of TS Bases section B 3.3.1) provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. The WBN procedure impact process requires upon implementation of the approved amendment that a procedure be in-place to verify the response time of the source range reactor trip by a combination of measured and allocated response times as described in Table 1.

Since the Gamma-Metrics Source Range Nuclear Instrumentation used at WBN was not evaluated in WCAP-14036-P-A, Revision 1, the response time of this equipment will be verified by an actual test. The response time of the Gamma-Metrics equipment, which is the

signal processing portion of the source range trip channels, will be determined by injecting a signal into the input of the wide range amplifier and measuring the time until a channel trip output is generated by the source range trip bistable. As noted in Table 1 and consistent with the current TS, neutron detectors are exempt from response time testing. An allocated response time for the Solid State Protection System (SSPS) logic was provided and justified in WCAP-14036-P-A, Revision 1 and will be used for verification of the source range reactor trip response time. Additional tests measure the reactor trip breaker response time and control rod gripper release delay time. The results of the tests are summed with the allowance for the actuation logic to verify that the total response time for the trip function is  $\leq 0.5$  seconds.

**3. Please describe any other surveillances or calibration done on the source range neutron flux instrumentation.**

Response to Question 3

The source range channels are periodically tested in accordance with the Technical Specification surveillance requirements (SR). These tests include a monthly CHANNEL OPERATIONAL TEST (SR 3.3.1.8) and an 18-month CHANNEL CALIBRATION (SRs 3.3.1.11, 3.3.3.3, and 3.9.3.2). In addition, a CHANNEL CHECK is required by SRs 3.3.1.1, 3.3.3.1 and 3.9.3.1.

**TABLE 1**  
**SOURCE RANGE REACTOR TRIP FUNCTION**  
**ALLOCATION TIMES**

FUNCTION	SENSOR	TIME (SEC)	NIS	TIME (SEC)	SSPS RELAYS (NOTE 3)	TIME (SEC)
SOURCE RANGE NEUTRON FLUX HIGH	NOTE 1	NA	NOTE 2	NA	INPUT	0.020

NOTES:

1. Neutron detectors are exempt from response time testing per Technical Specifications. As noted in description of the Technical Specifications Bases Surveillance Requirement 3.3.1.15, this is acceptable because the response of the detectors is virtually instantaneous.
2. The Gamma-Metrics Source Range Nuclear Instrumentation System (NIS) used at WBN was not evaluated in WCAP-14036-P-A Revision 1. Therefore, response time of the source range signal processing electronics will be verified by test. An allocated response time for this equipment will not be used.
3. Relays evaluated in WCAP-14036-P-A Revision 1 and used in the WBN SSPS are:
  - Input and Master Relays: G. P. Clare GP1 Series, Midtex/AEMCO 156, or Potter & Brumfield KH series.
  - Slave Relays: Westinghouse Type AR.

In accordance with Section 4.8 of WCAP-14036-P-A R1, the allocated response time for reactor trip functions is 20 msec, which is the response time of the SSPS input relays. Logic circuit response time was determined to be insignificant. Master and slave relays are not applicable to reactor trip functions.