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

March 27, 1985

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

Please refer to your letter dated March 15, 1985 which transmitted NRC concerns regarding the initial test program for the Watts Bar Nuclear Plant. Enclosed is our response to these concerns. Please note that several of the responses would require Final Safety Analysis Report (FSAR) revisions. These proposed revisions are included in this transmittal; however, formal update of the FSAR will take place in the next amendment (Amendment 56).

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

D. E. McCloud,
Nuclear Engineer

Sworn to and subscribed before me
this 27th day of Mar. 1985.

Bryant M. Lowery
Notary Public

My Commission Expires 4/8/86

Enclosure
cc: U.S. Nuclear Regulatory Commission (Enclosure)
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

A001
1/1

ENCLOSURE

Response to 413.02

(1) TVA-1 tests the EGTS system response to CIØA signal initiated by the manual closure of SSPS output relays K607, K612, and K613. The testing of CIØA regarding the EGTS system by this method is identical in results to that produced by various automatic CIOA actuation signals (tested in W7.3). The SSPS output relays K607, K612, and K613 operate the same way in either case and produce the following results in the EGTS system as tested in TVA-1:

1) Annulus vacuum fans stop

2) EGTS fans start

3) EGTS dampers open (or close) to the proper accident configuration.

Successful automatic CIØA actuation tested in W7.3 and successful manual CIØA actuation tested in TVA-1 combine to prove that the EGTS system will function properly in any CIOA situation.

(2) **TVA has revised its analysis to allow 500 cfm inleakage. FSAR changes will be submitted at a later date. The acceptance criteria of TVA-1 will be revised to delete the reference to a 50 cfm allowable deviation.**

TABLE 14.2-1

LIST OF PREOPERATIONAL TESTS
(Sheet 100)

Title of Test No. TVA-1	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria
Shield Building Inleakage Rate Tests, Emergency Gas Treatment System Functional Tests	The containment building, shield building, and the Emergency Gas Treatment System (EGTS) operable in preparation for testing. Penetrations fully installed and operable. Power and control circuitry for the EGTS operable and associated instrumentation calibrated and available for service. Construction testing and balancing of airflow rates shall have been completed.	The test demonstrates that the shield buildings and the Emergency Gas Treatment System have the capabilities needed to keep LOCA generated activity releases to or below the limits specified in 10 CFR 100. See Section 6.2.3 for a description of system operation and parameters. Test methods will be in accordance with Regulatory Guide 1.52 and ANSI N510-1975. The following tests will be performed to demonstrate fulfillment of system requirements: 1. Determination of shield building inleakage at 0.5 inches and 5.0 inches water negative pressure levels. Total infiltration will be shown to be within ~~50 cfm of~~ the expected values listed in Section 6.2.3.2.1 of FSAR. 2. Startup tests of annulus vacuum control subsystem, verification of automatic switchover to backup train for component failure, and verification of rated flow rates and vacuum level. Per paragraph 6.2.3.2.2 of FSAR. 3. Verification that a simulated containment isolation signal results in the following:

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Revised by Amendment 54

Response to 413.03

See attached revision to FSAR Q.

413.03 Question

Our review of your proposed startup testing phase provided in Table 14.2-2 disclosed that several tests described in Regulatory Guide 1.68 may not be scheduled to be performed. Describe your plans and provide test summaries (or justification for nonperformance) of tests identified in items B.1.c, B.1.j, C.1.h, D.1.a, D.1.b, D.1.g, D.1.j, D.1.n, D.1.p, and D.1.r of Regulatory Guide 1.68.

Response

Table 14.2-2 A&B, List of Startup Tests, has been revised to reflect various changes in scope and arrangement of testing. The revised table incorporated several new titles and a new numbering system. 44

The requirements of Regulatory Guide 1.68 are satisfied as summarized below:

Item	
B.1.c	See test summaries SU-1.3 and W-5.3.
B.1.j	Previous testing at Indian Point unit 2, Trojan, and Sequoyah unit 1 is applicable at Watts Bar and therefore precritical vibration monitoring will not be performed. TVA and Westinghouse will inspect the reactor internals for evidence of unusual vibration or wear after the hot functional testing. (Reference: Regulatory Guide 1.20, WBNP FSAR Section 3.9.2). 34
C.1.h	See test summaries SU-1.4. 53
D.1.a	~~Previous testing performed at Zion is applicable at Watts Bar and therefore natural circulation flow testing will not be performed. Refer to WCAP-8460.~~
D.1.b	See test summaries SU-1.9, and SU-4.1. Testing will be performed on unit 1 only.
D.1.g	See test summaries SU-1.5, SU-1.6, SU-1.7, SU-1.8, SU-1.9, W-9.5, and W-9.6. 53
D.1.j	See test summaries SU-1.5 and SU-6.3. Testing will be performed on unit 1 only.

D.1.a A modified natural circulation test will be performed on unit 1 only. See revised Table 14.2-2A for summary and objectives of SU-3.9.

Response to 413.04

This item deals with unit 2 and will thus be addressed at a later date.

Response to 413.05

See attached original response to 413.05. It directs response to 413.03 which is being revised to include SU-3.9.

413.05 Question:

Provide test summaries for SU-1.3 and SU-1.2 that are shown on Figure 14.2-3.

Response:

SU-1.3, Natural Circulation will not be performed. See response to question 413.03, Item D.1.a. See SU-6.3 for summary of shutdown from outside the control room.

Response to 413.12

1.a) Test objective 6 under TVA 18A was deleted to be consistent with the actual test. TVA-18C verifies adequate flow requirements to individual components. The objectives of test objective 6 under TVA 18A are contained in the test objective of TVA-18C.

1.b) The TVA design organization has evaluated the acceptance criteria change from 15.5 seconds to 20 seconds and found it acceptable. It should be noted that the overall system response time as required by Table 3.3-5 of the draft technical specifications is 65 seconds. The blackout pump start time delay is 15 seconds. Thus, the pumps are allowed 50 seconds to come up to rated speed.

2) The response to part 29 of this item as provided to NRC in the 2/26/82 letter will be incorporated into the FSAR in subsequent amendment.

3.a) The response to part 30 of this item as provided to NRC in the 2/26/82 letter will be incorporated into the FSAR in subsequent amendment.

3.b) The response to item e is contained in the discussion of item a. The communication systems tests are described in FSAR Table 14.2-1, Test TVA 11A and 11B.

3.c) Acceptance criteria for the plant evacuation alarm is discussed in FSAR Table 14.2.1 under Test TVA 11B. The actual criteria is subjective in that the preop test engineer makes the decision as to whether the alarms can be heard or visually distinguished.

Response to 413.23

(1) The response provided to NRC in the letter from D. S. Kammer (TVA) to E.Adensam (NRC) dated May 2, 1984 will be included in a subsequent FSAR amendment.

(2) See attached revised FSAR Table.

TABLE 14.2-2A

LIST OF STARTUP TESTS

Title of Test	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria
SU-3.9 - Natural Circulation Test	As specified in SU-1.4.	Objectives: ~~To provide operator training during the natural circulation transient and subsequent recovery~~. To provide to as many licensed operators as possible training in the initiation, maintenance, and recovery from a natural circulation transient. Summary: Natural circulation will be established following a simultaneous trip of all four (4) reactor coolant pumps while at 3-percent power. The transient response will be monitored and stable conditions established. Acceptance Criteria: ~~Stable conditions are established~~ Operations personnal were trained as per SU-1.1.
SU-4.1 - Power Coefficient Determination	As specified in SU-1.9.	Objectives: Determine the doppler coefficient verification factor for comparision to design. Summary: A load change of approximately 2% to 4% is initiated around the test plateau power. The reactor power is adjusted to match the generator load by withdrawing or inserting the controlling RCC bank. Correlative measurements of reactor coolant system temperatures and core thermal power output are used to determine the doppler coefficient verification factor. Acceptance Criteria: The measured versus predicted doppler coefficient verification factor agrees as specified in SU-1.1.
SU-4.3 - RCCA or Bank Worth Measurement at Power	~~As specified in SU-1.5 and SU-1.6.~~	Objectives: Describes a method for measuring changes in core reactivity resultant from RCCA or RCC bank movement when significant prompt reactivity feedback effects from the fuel temperature coefficient are present. Summary: This test is used in conjunction with SU-4.10A, ~~and~~ SU-4.11, ~~and 4.1~~ as rods are inserted or withdrawn as boron is constantly added or diluted. The worth of the rods is compensated for by boron. Rod movement will cause step changes in reactivity which are measured on a reactivity computer. or by changes in boron concentration.

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Response to 413.24

TVAs design organization had evaluated the reduced flow rate of 22,949 cfm and found them acceptable (ref. PT110). This flow rate can effectively purge the containment. The acceptance criteria had thus been changed to reflect 22,949 cfm.

Response to 413.25

Attached are revised table 14.2-2A pages which adds SU-4.3 to SU-1.5 and 1.6 acceptance criteria. Figure 14.2-3A already includes SU-4.3 under SU-1.5 and 1.6 and thus does not need revising.

TABLE 14.2-2A

LIST OF STARTUP TESTS

Title of Test	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria	
SU-1.6 (Con't)		data is performed per SU-6.1A, SU-6.1B.1 and SU-6.1B.2. NIS power range instrumentation is aligned per W-9.5. Steam generator level control is checked per W-8.2. Process temperature instrumentation alignment data is obtained per W-9.6. Data is obtained for alignment of the steam and feedwater flow instrumentation per W-9.4. Reactor and turbine control systems alignment data is obtained per W-9.7. A pseudo dropped RCCA is performed per SU-4.10A and its worth is measured per SU-4.3. Acceptance Criteria: Applicable acceptance criteria are specified in each referenced test and/or SU-1.1.	53 | 54 53
SU-1.7 - Test Sequence at 75% Power	Completion of testing specified in SU-1.6, except as noted in SU-1.1.	Objectives: Define the sequence of operations during escalation from 50% to 75% power and the testing program at approximately 75% of rated thermal power. Define configurations for data acquisitions with appropriate precautions. Summary: Power is increased to 75% and measured per SU-4.5. Thermal expansion of piping systems is monitored per TVA-23 as necessary. A survey of plant operational data is performed per SU-6.1A, SU-6.1B.1 and SU-6.1B.2. NIS power range instrumentation is aligned per W-9.5. Process temperature instrumentation alignment data is obtained per W-9.6. Data is obtained for alignment of the steam and feedwater flow instrumentation per W-9.4. Reactor and turbine control system alignment data is obtained per W-9.7. Flux maps are obtained per TI-41 and calibration of axial flux difference instrumentation is performed per W-9.11. Load swing tests are conducted per SU-4.7. Large load reduction tests are performed per SU-4.8. Acceptance Criteria: Applicable acceptance criteria are specified in each referenced test and/or SU-1.1.	53 53 49 53 44

TABLE 14.2-2A

LIST OF STARTUP TESTS

Title of Test	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria	
SU-1.5 (Con't)		Summary: Data is obtained for alignment of the steam and feedwater flow instrumentation per W-9.4. Alignment data for the reactor and turbine control systems is obtained per W-9.7. Automatic steam dump is tested per W-8.5. Auxiliary feedwater is tested per TVA-22. Thermal expansion of piping systems are monitored per TVA-23 as necessary. Reactor power is increased to approximately 10% and the turbine-generator synchronized with the grid. A survey of plant operational measurements is performed per SU-6.1A, SU-6.1B.1 and SU-6.1B.2. Power is increased to approximately 30% and another set of data obtained per SU-6.1A, SU-6.1B.1 and SU-6.1B.2. Reactor thermal power is measured per SU-4.5. NIS power range alignment data is obtained per W-9.5. Temperature instrumentation alignment data is obtained per W-9.6. Steam and feedwater flow instrumentation alignment data is obtained per W-9.4. Reactor and turbine control system alignment data is obtained per W-9.7. Automatic reactor control is checked per W-8.1. A pseudo ejected RCCA is performed per SU-4.11, and its worth measured per SU-4.3. Shutdown from outside the control room is performed per SU-6.3. Load Swing tests are conducted per SU-4.7. Loss of offiste power is conducted per SU-6.2.	46 53 53 53
		Acceptance Criteria: Applicable acceptance critieria are specified in each referenced test and/or SU-1.1.	
SU-1.6 - Test Sequence at 50% Power	Completion of testing specified in SU-1.5, except as noted in SU-1.1.	Objectives: Define the sequence of operations and testing during escalation from 30% to 50% power and the testing program at approximately 50% of rated thermal power. Define configurations for data acquisition with appropriate precautions.	53
		Summary: Thermal expansion of piping systems is monitored per TVA-23 as necessary. NIS power range instrumentation is aligned per W-9.5. Power is increased to 50% and measured per SU-4.5. A survey of plant operational	49 53

Revised by Amendment 53
Sheet 4

Response to 413.26

Attached are changes to SU-1.1 that will be made. These changes address the reviewer's concerns.

2. M/D Flux Map; HZP CD at zero.

(Ω)A. The relative assembly power error (P_r) is within the limits of ± 10% for $P_I \geq 0.9$, ± 15% for $P_I < 0.9$.

_____/_____

(Ω)B. The quadrant power tilt ratio is ≤ 1.02

_____/_____

(Ω)C. $F^N_{\Delta H}$ is within the limits of 1.53 ± 0.15.

_____/_____

6.1.4.6 SU-3.8A

(Ω)1. CD reactivity worth is within the limits of 1471 ± 147 pcm.

_____/_____

6.1.4.7 SU-3.8B

(Ω)1. Total bank reactivity worth is within the limits of 5950 ± 595 pcm.

(Ω)2. The absolute value of each individual bank is within ± 15% of the predicted values listed below.

Control Bank	Integral Bank Worth (PCM)
SA	397
SB	1044
SC	430
SD	430
CA	405
CB	741
CC	1032

_____/_____

6.1.4.8 SU-3.9

(Ω)1. As many licensed operators as possible have been trained in the ~~Natural circulation has been demonstrated.~~ initiation, maintenance, and recovery from the natural circulation transient.

_____/_____

6.1.4.9 SU-6.1A

(Ω)1. The plant manager shall be informed of any unusual radiation survey data and all data which exceeds the criteria stated on the data sheets.

_____/_____

6.1.4.10 SU-6.1.b.1

(Ω) 1. Acceptance criteria is in the test itself. All acceptance criteria have been met.

/

6.1.4.11 SU-6.1.b.2

(Ω) 1. Acceptance criteria is in the test itself. All acceptance criteria have been met.

/

6.1.5 SU-1.5

6.1.5.1 TI-41

1. M/D Flux map 30%; Rods at HFP insertion limit.

(Ω) A. The relative assembly power error (P_I) is within the limits of ±10% for $P_I \geq 0.9$, ±15% for $P_I < 0.9$.

/

(Ω) B. The Quadrant Power Tilt Ratio is ≤ 1.02.

/

2. M/D Flux Map 30%; RCCA pseudo ejection. (SU-4.11) RJW 3/14/85

(Ω) A. The relative assembly power error (P_I) is within the limits of ± 10% for $P_I \geq 0.9$, ±10.1% for $P_I < 0.9$.

/

(β) B. $F_Q^T = F_Q^N \times 1.05 \times 1.03 \leq 4.10$

/

6.1.5.2 SU-4.7

(Ω) 1. The following acceptance criteria are to be used to determine successful test completion. Failure to meet these criteria do not constitute a need for stopping the test program. Correction of any deficiencies which preclude meeting these criteria should be accomplished as required consistent with the current plant schedule.

A. Reactor and turbine did not trip.

/

(Ω)
4. Only AOI-27 and the equipment specified therein were required to perform SU-6.3.

/

(Ω)
5. All actions taken by observation personnel did not impact the safe shutdown of the plant, within the scope of SU-6.3, if not performed.

/

6.1.6 SU-1.6

6.1.6.1 TI-41

1. M/D Flux Map; 50%

(Ω)A. The relative assembly power error (P_I) is within the limits of ± 10% for $P_I \geq 0.9$, ± 15% for $P_I < 0.9$.

/

(Ω)B. The quadrant power tilt ratio is ≤ 1.02.

/

2. M/D Flux Map, 50% RCCA Pseudo Drop (SU-4.1A) PLW 3/14/85

(Ω)A. The relative assembly power error (P_I) is within the limits of ± 10% for $P_I \geq 0.9$, ± 0.1 for $P_I < 0.9$.

/

(β)B. $F^T_{\Delta H} = F^N_{\Delta H} \times 1.04 \leq 1.68$

/

6.1.6.2 SU-6.1A

(Ω)
1. The plant manager shall be informed of any unusual radiation survey data and all data which exceeds the criteria stated on the sheets.

/

6.1.6.3 SU-6.1.b.1

(Ω)
1. Acceptance criteria are in the test itself. All acceptance criteria have been met.

/

Response to 413.27

Attached are marked up FSAR changes to correct the typographical errors identified.

NOTE: Item 3 on TVA-9C has been corrected in amendment 55.

TABLE 14.2-2B

LIST OF STARTUP TESTS

Title of Test	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria	
SU-4.6 (Con't)			
		Acceptance Criteria: Measured moisture carryover must be less than or equal to the warranted value ~~of 99~~ 95 specified in SU-1.1.	54
SU-4.7 - Load Swing Tests	As specified in SU-1.5, SU-1.7, and SU-1.9.	Objectives: Verify proper nuclear plant transient response, including automatic control system performance, when 10% step load changes are introduced at the turbine generator. Summary: Connect transient recorders to monitor plant parameters, (e.g., flux, coolant temperatures, feedwater and steam flows, steam generator and pressurizer water levels, feedwater pump speed and discharge pressure). Manually decrease plant load 10%. After parameters have stabilized, manually increase plant load 10%. Acceptance Criteria: The following criteria will be used to determine successful test completion: 1) reactor and turbine do not trip and safety injection is not initiated, 2) steam generator and pressurizer relief and safety valves do not lift, and 3) monitored plant parameters stabilize without manual intervention as specified in SU-1.1.	
SU-4.8 - Large Load Reduction Tests	As specified in SU-1.7 and SU-1.9.	Objectives: Verify the ability of the primary and secondary plant and the Automatic Reactor Control Systems to sustain a 50% step-load reduction from 75% and 100% full power. Evaluate the interaction between the control systems. Evaluate test data to determine if possible setpoint changes are required in the control systems in order to improve transient response. Summary: Connect transient recorders to monitor plant parameters (e.g., flux, coolant temperatures, feedwater and steam flows, steam generator and pressurizer water levels, feedwater pump speed and discharge pressure). Turbine governor valves are repositioned to	54

TABLE 14.2-1

LIST OF PREOPERATIONAL TESTS
(Sheet 81)

Title of Test No. W10.1B	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria	
		operational tests. 9 ~~10~~. Test the SFP pumps to verify they provide adequate flow during various operational modes. 10 ~~11~~. Test the SFP skimmer pumps for adequate flow. The test will be conducted in accordance with WBNP System Operating Instructions SOI-78.1. The testing will demonstrate the operability of the Spent Fuel Pool Cooling System during various operational modes. The test will also simulate various abnormal conditions to ensure the instrument alarms actuate properly. The test will verify design basis information contained in WBNP FSAR subsection 9.1.3. The test acceptance criteria are: 1. The SFP, transfer canal, and fuel-cask loading area are filled. 2. The skimmer loop operated satisfactorily. 3. The SFP, transfer canal, and fuel-cask loading area were dewatered as required. 4. There was adequate circulation through the SFP demineralizers and heat exchanger loops.	48 48

Revised by Amendment 48

TABLE 14.2-1

LIST OF PREOPERATIONAL TESTS
(Sheet 17)

Title of Test No. *W1.8	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria
*Reactor Coolant Flow Coastdown	Initial core loading completed and reactor plant at hot shutdown conditions with all control rod assemblies at bottom position.	Test objectives are to measure the rate at which reactor coolant flow rate changes subsequent to all reactor coolant pumps trip and to measure the delay times associated with the loss of flow accident. Measurements are made by tripping all coolant pumps and recording coolant loop d/p, coolant pump breaker position, SSPS input bistable voltage and reactor trip breaker position. Acceptance criteria for test are as follows: 54
	All RCS pumps operating. System pressure being maintained in normal control band. Pressure damping devices installed in elbow tap d/p cell sensing lines for RCS flow measurement test have been removed. Reactor Protection System time response measurement (W7.1B) is complete. Reactor coolant flow instruments have been aligned and adjusted.	1. RCP breakers opening time for 4 out of 4 flow coastdown case is less than or equal to 100 ms. 2. Normalized core coastdown flow for all cases of flow coastdown tested exceed core coastdown flow values assumed by WBN FSAR for the first 10 seconds of flow coastdown. 48 3. The measured Low Flow Trip Time Delay is less than 1.0 second for the time the flow reaches the low flow trip setpoint until the rods are free to fall. 48 54

*Preoperational test to be completed after fuel loading.

Revised by Amendment 54

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

March 26, 1985

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

Submitted herewith are 60 copies of Amendment 55 to the Watts Bar Nuclear Plant Final Safety Analysis Report. This amendment consists of miscellaneous FSAR text revisions.

An instruction sheet for incorporating this amendment into the FSAR is included with each copy.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

D. E. McCloud,
Nuclear Engineer

Sworn to and subscribed before me
this 26th day of Mar 1985.

Bryant M. Lowery
Notary Public

My Commission Expires 4/8/86

Enclosure (60)
cc: U.S. Nuclear Regulatory Commission (Enclosure)
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

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3/60