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NRC FORM 474
(1-80)
10 CFR 55.45(b),
55.4 and 55.5

U.S. NUCLEAR REGULATORY COMMISSION

SIMULATION FACILITY CERTIFICATION

APPROVED BY OMB: NO. 3150-0138
EXPIRES: 9-30-92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 120 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0138), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

INSTRUCTIONS. This form is to be filed for initial certification, recertification (if required), and for any change to a simulation facility performance testing plan made after initial submittal of such a plan. Provide the following information, and check the appropriate box to indicate reason for submittal.

FACILITY	DOCKET NUMBER
Sequoyah Nuclear Plant Unit 1	50-327
LICENSEE	**DATE**
Tennessee Valley Authority	

This is to certify that:

1. The above named facility licensee is using a simulation facility consisting solely of a plant-referenced simulator that meets the requirements of 10 CFR 55.45.
2. Documentation is available for NRC review in accordance with 10 CFR 55.45(b).
3. This simulation facility meets the guidance contained in ANSI/ANS 3.5, 1985, as endorsed by NRC Regulatory Guide 1.149.

If there are any exceptions to the certification of this item, check here [X] and describe fully on additional pages as necessary.

NAME *(or other identification)* AND LOCATION OF SIMULATION FACILITY

Sequoyah Nuclear Plant Simulator - near Soddy-Daisy, Tennessee

[X] SIMULATION FACILITY PERFORMANCE TEST ABSTRACTS ATTACHED. *(For performance tests conducted in the period ending with the date of this certification)*

DESCRIPTION OF PERFORMANCE TESTING COMPLETED *(Attach additional page(s) as necessary, and identify the item description being continued)*

See attached at Tabs 4 through 25

[ ] SIMULATION FACILITY PERFORMANCE TESTING SCHEDULE ATTACHED. *(For the conduct of approximately 25% of performance tests per year for the four year period commencing with the date of this certification.)*

DESCRIPTION OF PERFORMANCE TESTING TO BE CONDUCTED. *(Attach additional page(s) as necessary, and identify the item description being continued)*

See attached at Tab 26

[ ] PERFORMANCE TESTING PLAN CHANGE. *(For any modification to a performance testing plan submitted on a previous certification)*

DESCRIPTION OF PERFORMANCE TESTING PLAN CHANGE *(Attach additional page(s) as necessary, and identify the item description being continued)*

Initial certification/not applicable

[ ] RECERTIFICATION *(Describe corrective actions taken, attach results of completed performance testing in accordance with 10 CFR § 55.45(b)(5)(iv). Attach additional page(s) as necessary, and identify the item description being continued.)*

Initial certification/not applicable

Any false statement or omission in this document, including attachments, may be subject to civil and criminal sanctions. I certify under penalty of perjury that the information in document and attachments is true and correct.

SIGNATURE - AUTHORIZED REPRESENTATIVE	TITLE	DATE
Nicholas C Kazanas	Vice President, Operations Services	3/12/91

In accordance with 10 CFR § 55.5, Communications, this form shall be submitted to the NRC as follows:

BY MAIL ADDRESSED TO: Director, Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

BY DELIVERY IN PERSON TO THE NRC OFFICE AT: One White Flint North
11555 Rockville Pike
Rockville, MD

NRC FORM 474 (1-80)
10 CFR 55.45(b), 55.4 and 55.5

U.S. NUCLEAR REGULATORY COMMISSION

SIMULATION FACILITY CERTIFICATION

INSTRUCTIONS. This form is to be filed for initial certification, recertification (if required), and for any change to a simulation facility performance testing plan made after initial submittal of such a plan. Provide the following information, and check the appropriate box to indicate reason for submittal.

FACILITY: Sequoyah Nuclear Plant Unit 2

DOCKET NUMBER: 50-328

LICENSEE: Tennessee Valley Authority

DATE:

This is to certify that:

1. The above named facility licensee is using a simulation facility consisting solely of a plant-referenced simulator that meets the requirements of 10 CFR 55.45.
2. Documentation is available for NRC review in accordance with 10 CFR 55.45(b).
3. This simulation facility meets the guidance contained in ANSI/ANS 3.5, 1985, as endorsed by NRC Regulatory Guide 1.149.

If there are any exceptions to the certification of this item, check here [X] and describe fully on additional pages as necessary.

NAME *(or other identification)* AND LOCATION OF SIMULATION FACILITY

Sequoyah Nuclear Plant Simulator - near Soddy-Daisy, Tennessee

[ ] SIMULATION FACILITY PERFORMANCE TEST ABSTRACTS ATTACHED. *(For performance tests conducted in the period ending with the date of this certification.)*

DESCRIPTION OF PERFORMANCE TESTING COMPLETED *(Attach additional page(s) as necessary, and identify the item description being continued)*

See attached at Tabs 4 through 25
(Unit 1 testing was used; see also paragraph 2 of Simulator (General) Information)

[ ] SIMULATION FACILITY PERFORMANCE TESTING SCHEDULE ATTACHED. *(For the conduct of approximately 25% of performance tests per year for the following period commencing with the date of this certification.)*

DESCRIPTION OF PERFORMANCE TESTING TO BE CONDUCTED. *(Attach additional page(s) as necessary, and identify the item description being continued)*

See attached at Tab 26
(Unit 2 testing is adequately covered by Unit 1 testing)

[ ] PERFORMANCE TESTING PLAN CHANGE. *(For any modification to a performance testing plan submitted on a previous certification)*

DESCRIPTION OF PERFORMANCE TESTING PLAN CHANGE *(Attach additional page(s) as necessary, and identify the item description being continued)*

Initial certification/not applicable

[ ] RECERTIFICATION *(Describe corrective actions taken, attach results of completed performance testing in accordance with 10 CFR § 55.45(b)(5)(iv). Attach additional page(s) as necessary, and identify the item description being continued.)*

Initial certification/not applicable

Any false statement or omission in this document, including attachments, may be subject to civil and criminal sanctions. I certify under penalty of perjury that the information in this document and attachments is true and correct.

NATURE – AUTHORIZED REPRESENTATIVE	TITLE	DATE
Nicholas C Kazanas	Vice President, Operations Services	3/12/91

In accordance with 10 CFR § 55.5, Communications, this form shall be submitted to the NRC as follows:

BY MAIL ADDRESSED TO: Director, Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

BY DELIVERY IN PERSON TO THE NRC OFFICE AT: One White Flint North
11555 Rockville Pike
Rockville, MD

SIMULATOR INFORMATION

A. General

The Sequoyah Nuclear Plant (SQN) Unit 1 simulator is owned, operated, and maintained by TVA at the plant site. It is a Singer-Link Miles supplied, full-scope simulation of the Westinghouse 4-loop PWR built there by TVA. The simulator was first operational in 1977 and was the fifth utility owned nuclear plant control room simulator manufactured in the United States. A complete upgrade of the simulator software designed to increase the scope of simulation to ANS 3.5 - 1985 requirements was completed in March 1991. The simulator now features state-of-the-art reactor core and thermal-hydraulics modeling, extensive electrical system modeling, and a powerful, yet easy to use, instructor station.

This attachment also supports the certification of the Sequoyah Unit 1 simulator for Sequoyah Unit 2. It has been TVA's past practice and continues to be TVA's intention to keep the two units practically identical. NRC has recognized the similarity of the units by issuing multi-unit licenses for Sequoyah operators. Major differences between the units exist only temporarily due to outage schedules. When these differences arise, TVA evaluates the impact of the differences on training and exams and, if the situation warrants, maintains separate simulator configurations for Unit 1 and Unit 2. The primary difference between Unit 1 and Unit 2 is the location of the switchyard control board and the common panels relative to the main control room "horseshoe" panels. Facing Unit 1, the switchyard control board is on the left and the common panels are on the right. Facing Unit 2, they are reversed. This has not posed a problem with training or examinations in the past.

Initial certification testing was completed in March 1991, and the results are included here. The Sequoyah Simulator Services Staff used corporate Nuclear Training simulator certification test instructions (draft) to perform the tests summarized in this submittal.

B. Physical Fidelity

The following items are maintained equivalent to or better than the certified conditions by periodic checks using procedures tests, photograph comparisons, malfunction tests, student/instructor feedback and plant design change reviews.

- Control Room Physical Arrangement: The simulator room layout was determined by actual measurements of plant control room layout. Except for those differences mentioned below, simulated equipment is arranged so that the operator must walk or look in the same direction and with the same obstructions in the simulator room as in the plant control room.

- Panels/Equipment: The simulated panels, control room furniture, and functionally or visually simulated equipment have been determined adequate to the extent necessary to perform the referenced plant evolutions used in training and examinations.

- Simulator Control Room Environment: The simulator provides similar flooring, control room equipment sounds, and annunciator alarm sounds by using equipment that is similar or identical to plant equipment. No outside control room sounds are provided since no operator cues to plant conditions are determined by outside sounds. Simulator lighting is not similar.

A detailed photograph comparison was done in February 1991. This involved taking close-up photographs of the plant control panels and comparing them to the simulator. This comparison provided a listing of any differences in location, labels, colors, etc. Each difference was evaluated by the simulator hardware engineer and Operations Training. There are no major differences in instrumentation or dimensions of panels. However, the location of M-27A and M-27B was identified as a discrepancy. Compared to the referenced plant, these panels are on the opposite side of the simulator room. Simulator design change, SDCR-473, has been initiated to review this discrepancy and determine if corrective action should be taken.

- Exception Summary: As a result of the above Physical Fidelity reviews, differences between the plant and the simulator were itemized. Evaluation of these differences against the ANSI 3.5 criteria resulted in the identification of eleven hardware exceptions. These exceptions are detailed at Tab 3 and are summarized below.

  The ceiling and overhead lighting do not match the plant control room. The control room has a diffuser grid ceiling suspended approximately twelve inches above the top of the panels. A.C. fluorescent lighting is distributed above the diffuser grid. D.C. emergency lighting is suspended beneath the grid or located on the walls. The simulator room has a high ceiling with recessed mercury vapor lighting to facilitate viewing from a visitor's overlook. Neither the D.C. lighting nor loss of A.C. lighting is simulated.

  The following paragraphs summarize the exceptions taken to the scope of control panel simulation and panel arrangement:

  a. Seven control room panels are not simulated.

     M-7 Preferred and instrument power transfer and distribution breakers.

     M-8 Turbine supervisory power drawers and control rod lift coil disconnect switches.

     M-11 Gross failed fuel detector system.

M-21 Annunciator Logic Cabinet.

M-22 Annunciator/Status Light Demultiplexor Cabinet.

M-25 Wind speed/direction, river/air temperature recorders.

M-28 Cooling tower control.

b. The switchyard control board is only partially simulated. Top-to-bottom spacing of breaker controls and instrumentation is preserved. Side-to-side spacing between bays has been collapsed due to limited floor space.

c. Panels M-30 and M-31 are located closer to panel M-1 than in the plant. Panels M-9 and M-10 are located slightly off control room centerline.

These differences have not compromised exam validity in the past and do not prevent the use of plant procedures while performing plant evolutions used in exams and training. However, modifications to change the simulator room ceiling and lighting are currently being considered by TVA.

C. Functional Fidelity

The simulator is designed to allow operation of all systems controlled from the plant control room during the use of normal, abnormal, or emergency plant instructions. When a system is normally operated by control manipulations from the plant control room, that capability exists on the simulator and produces similar integrated plant responses and indications. When a component is normally operated from outside the plant control room but requires operator direction, a remote function for local operator action (LOA) is available to the instructor. The periodic procedures tests verify that enough LOAs exist to allow performance of significant plant evolutions. Each LOA provides an appropriate integrated plant response. The operator communicates with the instructor in a manner similar to the reference plant, i.e., through the radio, telephone and paging systems.

The Sequoyah Simulator was tested for functional fidelity in four major categories:

1. computer real time;
2. steady state and normal operations;
3. transient performance; and
4. malfunction performance.

There are no exceptions identified as a result of these performance tests. Abstracts or summaries are provided for each at Tabs 4 through 25. All test data collected will be maintained at the simulator site to satisfy the requirements of 10CFR55.45(b)(5)(iii).

The Sequoyah plant-referenced simulator operates with the Singer-Link designed S3 software and all code is executed through control of the Real-Time Executives (RTEXEC). This executive allows a calculated maximum execution time for each software module and checks that limit twelve times each second. If any module exceeds its execution time in that 1/12 second or "frame", then a check flag is set. If, in the next frame, this occurs again, then RTEXEC will stop the simulator and alarm to the instructor that an overtime condition has occurred. If timing is normal, the check flag is cleared. A message is also stored so that software engineers can identify which module caused that overtime condition.

This RTEXEC control is sufficient to insure that simulation is always in real-time. A simple stop watch was used to verify timing. This check verified that all systems were in fact operating in real-time. Sequoyah will generally rely on the RTEXECs to ensure continued real-time.

D. Problem Reporting and Configuration Control

In accordance with Appendix A of ANSI/ANS-3.5 (1985), draft administrative procedures exist for the handling of reported simulator discrepancies and for the tracking of design changes in the referenced plant that have not been incorporated into the simulator.

Instructors, students, and simulator maintenance personnel are encouraged to question the behavior and appearance of the simulator compared to the referenced plant. When a suspected simulator problem is identified, a Problem Report (PR) is completed on a standard form and submitted to Simulator Services. The problem reporting process is used to document the course of investigation, corrective action, and post-maintenance testing required to resolve a simulator problem.

Changes to the design of the referenced plant are reviewed as they occur. If the changes affect the simulator, then another standard form, a Simulator Design Change Request (SDCR), is prepared and approved to authorize changes to the simulator. Simulator design changes are implemented through approved Work Plans which provide detailed work instructions and specify the requirements for post-modification testing and for the updating of simulator design documents. Both the PR and SDCR processes utilize electronic databases for the tracking and scheduling of work. The Simulator Services Manager is responsible for scheduling and tracking work related to the timely resolution of SDCRs and PRs. All discrepancies noted in the attached abstracts are tracked and have a "certification" priority.

The Operations Training Group reviews industry events and License Event Reports (LERs) and determines if simulator training is applicable. If it is determined that simulator training is appropriate and that the present configuration or performance of the simulator will not support the training objective, then the Operations Training Group will request that modifications be made to the simulator. To date, none of the industry events and LERs reviewed by the Operations Training Group have required modification of the simulator.

E. Instructor Interface

The SQN simulator works with the state-of-the-art Third Generation Instructor Station (TGIS) revision that supports the Singer-Link Miles Advanced Man Machine Interface (AMMI). All functions are available from menus activated by mouse or expert commands. There are 81 initial condition (IC) storage locations with 20 password protected initial conditions available. These protected ICs are changed only through administrative controls requiring Operator Training and simulator engineering approval.

There are approximately 210 malfunctions and 400 remote functions available with variable rates when required. The capability exists also to add or modify malfunctions as required.

Additional features exist for the instructor to display, trend, or obtain a hardcopy of any calculated variable used in the simulation models. Forty variables can be collected at 0.50 second resolution.

F. Simulation Limits

The computer power and industry experience available to simulators now allows a very large scope of simulation for a reasonable cost. Because of this, the Sequoyah model has Singer-Link's state-of-the-art advanced core and thermal-hydraulics simulation along with very detailed systems coding. These facts allow for fewer simulation limits than in the past. However, the following limits have been imposed on the Sequoyah Simulator and each initiates an alarm message and automatically stops the simulation:

1. Containment pressure exceeds design
2. Fuel clad temperatures exceed clad melt point
3. Turbine extraction lines flooded
4. Turbine shaft seized

Each of these limits was established during the upgrade of the simulator. Others may be added as needed.

G. Qualifications of Certification Team

The Sequoyah Simulator Certification Team was composed of:

1 Section Manager

2 SRO Simulator Instructors

1 Corporate Manager, Simulator Programs

All tests were reviewed by the Simulator Certification Team for best estimate performance and for training impact. The following describes the qualifications of the individuals who principally prepared and reviewed this package.

Steve M. Michael, Simulator Manager

Mr. Michael has 14 years in the TVA nuclear program. This includes operations experience at each of TVA's nuclear plants with SRO certification at Bellefonte and Watts Bar and SRO simulator instructor experience at Bellefonte, Sequoyah and Watts Bar. Mr. Michael has a B.S. Degree in Physics.

J. Fletcher Gibbs, TVA Corporate Simulator Programs Manager

Mr. Gibbs has over 10 years in the TVA simulator department and has worked as software engineer on all of TVA's simulators. He was responsible for specification development for the purchase of the Watts Bar plant-referenced simulator. Mr. Gibbs holds a M.S. in Nuclear Engineering and is involved in development of new computer systems for TVA's simulator programs.

V. Ed Keyser, Jr., SRO Simulator Instructor

Mr. Keyser has 14 years in the TVA nuclear program. This includes startup and operation of both units at Sequoyah. Mr. Keyser was an RO in 1980 when the Sequoyah units came on line. He later served as an SRO for both units. Mr. Keyser has worked as an SRO simulator instructor for the past seven years.

Bennett C. Lake, SRO Simulator Instructor

Mr. Lake has over 18 years in the TVA nuclear program. He obtained an SRO cold license on Sequoyah units 1 and 2. He worked on shift as Shift Operations Supervisor for several years. For the past eight years, he has worked as Training Supervisor and as an SRO simulator instructor.

Donald L. Conner, Sequoyah Site Training Manager

Mr. Conner has over 20 years' experience in the nuclear industry and holds a B.S. in Electrical Engineering. Related work experience includes assignments in managing training of personnel who would maintain simulator equipment and personnel who administer simulator SRO training. Mr. Conner had oversight responsibility for preparation of the simulator certification package.

Qualification of Reviewers

The following describes the qualifications of the individuals who prepared and reviewed the transient descriptions for use in evaluating simulator performance.

Robert H. Bryan, Reviewer

Mr. Bryan has 17 years experience in the analysis of nuclear power plant accidents. This experience has focused both on reactor coolant system response as well as the containment response for both BWRs and PWRs. In positions held by Mr. Bryan, he has been responsible for the evaluation, review, and approval of the FSAR sections related to accident analysis for SQN and WBN. Specific accident analyses for which Mr. Bryan has been involved include the BIT removal at SQN and WBN, UHI removal at WBN and SQN, ECCS analyses at WBN and SQN. Mr. Bryan is also a member of the NSAC committee on Safety Analysis.

Mr. Bryan is currently the Manager of Nuclear Steam Supply Systems and Analysis in TVA Corporate Engineering in Knoxville.

Randall M. DeVault, Reviewer

Mr. DeVault has over 10 years of nuclear power plant experience primarily in the areas of design basis and beyond design basis analyses and their effects on equipment. Mr. DeVault has extensive experience in PWR accident analysis based on several years of work on Sequoyah and Watts Bar. Mr. DeVault is a recognized industry expert on the ice condenser containment.

Mr. DeVault is currently a member of the Nuclear Steam Supply Systems and Analysis section in TVA Corporate Engineering in Knoxville.

K. D. Keith, Preparer

Mr. Keith has 12 years experience in the analysis of nuclear power plant accidents. This experience has focused on the response of the reactor coolant system for BWRs and PWRS for both design basis events and beyond design basis events. Mr. Keith is currently the Safety Analysis section manager in TVA Engineering and is responsible for WBN Chapter 15 analyses. Mr. Keith has served on industry committees related to ECCS, specifically analysis related issues.

John A. Vogel, Reviewer

Mr. Vogel has more than 30 years experience in the nuclear fluid systems at Westinghouse and TVA. Mr. Vogel's experience includes the fluid systems design for the Watts Bar and Sequoyah Nuclear Plants. Mr. Vogel is currently a staff specialist in TVA Engineering supporting both Watts Bar and Sequoyah as needed.

EXCEPTION REPORT
NT-3.02, Attachment 7
Appendix H

Originator: C. E. Scarbrough		Report No. ER-1
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: M-30, M-23

Description of Exception: No camera equipment mounted at top of panels at plant.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: Camera equipment is located outside of horseshoe and is high enough to be of no impact to operator vision.

Approved: Steve M Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: [signature] 3/5/91
Manager, Operator Training (Site) Date

Concurrence: [signature] 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
NT-3.02, Attachment 7
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Originator: C. E. Scarbrough		Report No
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: N/A

Description of Exception: Simulator room ceiling and lighting do not match the plant. Plant control room ceiling is a diffuser grid suspended approximately 12 inches above the top of the panels. Plant A.C. lighting is fluorescent lighting suspended above the diffuser grid. Plant D.C. lighting is either wall mounted or suspended below the diffuser grid. The simulator room has a high ceiling with recessed mercury vapor lighting to facilitate viewing from a visitor's overlook. Neither the D.C. lighting nor loss of A.C. lighting is simulated.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: Lighting intensity is not an issue. No compromise in training or exam validity has ever occurred due to this difference. Modification to the simulator room to correct this deficiency is not considered economically justifiable for the increase in simulator fidelity. Simulator DCR S-472 has been issued as a vehicle to further study this issue.

Approved: Steve M. Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: [signature] 3/5/91
Manager, Operator Training (Site) Date

Concurrence: [signature] 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
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Appendix H

Originator: C. E. Scarbrough		Report No. ER-3
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: M-7

Description of Exception: Panel M-7 is not simulated. This panel contains preferred and instrument power distribution breakers and transfer switches.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: Absence of this panel has no negative impact to training and would not be needed to administer exams. The distribution panel breakers are not simulated in software, but the transfer switches are. The instructor may operate these switches via the instructor station should the need arise.

Approved: Steve M. Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: [signature] 3/5/91
Manager, Operator Training (Site) Date

Concurrence: J. Fletcher Gibbs 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
NT-3.02, Attachment 7
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Originator: C. E. Scarbrough		Report No. ER-4
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: M-8

Description of Exception: Panel M-8 is not simulated. This panel contains Main Turbine Supervisory instrumentation power drawers and the control rod lift coil disconnect switch box.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: No training or exam value for visually or functionally simulating the Turbine Supervisory power drawers exists since there are no controls on these instruments and alarms are annunciated. The control rod lift coil disconnect switch box can be operated with LOAs at the instructor's station.

Approved: Steve M. Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: [signature] 3/5/91
Manager, Operator Training (Site) Date

Concurrence: [signature] 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
NT-3.02, Attachment 7
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Originator: C. E. Scarbrough		Report No. ER-5
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: M-11

Description of Exception: Panel M-11 is nct simulated. This panel contains the Gross Failed Fuel detector system (GFFDS).

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: The GFFDS is not operational at the plant and will be removed in Cycle 5. The panel space will be added at a later time due to various instrument relocations planned for this panel.

Approved: Steve M. Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: [signature] 3/5/91
Manager, Operator Training (Site) Date

Concurrence: [signature] 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
NT-3.02, Attachment 7
Appendix H

Originator: C. E. Scarbrough		Report No. ER-6
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: M-21, M-22

Description of Exception: Panels M-21 and M-22 are not simulated. These panels contain the annunciator logic and demultiplexer.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: These panels have no operator manipulated controls and do not serve as visual cues or obstacles used for locating or operating other instrumentation.

Approved: Steve M. Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: Wayne T. Bartlett 3/5/91
Manager, Operator Training (Site) Date

Concurrence: J. Hutchinson 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
NT-3.02, Attachment 7
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Originator: C. E. Scarbrough		Report No. ER-7
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: M-25

Description of Exception: Panel M-25 is not simulated. This panel contains wind speed, wind direction, river temperature, and air temperature recorders.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: The instrumentation on this panel will be removed in Cycle 5. If future instrumentation is located on this panel, simulation will be reconsidered.

Approved: Steve M. Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: [signature] 3/5/91
Manager, Operator Training (Site) Date

Concurrence: [signature] 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
NT-3.02, Attachment 7
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Originator: C. E. Scarbrough	Report No. ER-8
Date: 3/4/91	Transferred from SDCR-N/A SPR-N/A
IC #: N/A	Malfunction #: N/A / Panel #: M-28

Description of Exception: Panel M-28 is not simulated. This panel contains the cooling tower controls.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: To date, there has been no simulator training or examination on cooling tower operation. Until the need arises for such simulation, the absence of this panel has no negative impact on training or exams.

Approved: Steve M. Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: [signature] 3/5/91
Manager, Operator Training (Site) Date

Concurrence: [signature] 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR _____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
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Originator: C. E. Scarbrough		Report No. ER-9
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: ECB

Description of Exception: The Switchyard Control Board is only partially simulated, and the side-to-side spacing of breaker bays has been collapsed to preserve floor space.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: The simulation was restricted due to limited floor space, but includes all elements necessary for training on exams: Common Station Service Transformer, Start Bus 1A and 1B, two offsite power supplies, and the 161 kV to 500 kV switchyard intertie.

Approved: Steve M. Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: Clyde D. Bentsen 3/5/91
Manager, Operator Training (Site) Date

Concurrence: J. Luther Cash 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
NT-3.02, Attachment 7
Appendix H

Originator: C. E. Scarbr ugh		Report No. ER-10
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: M-30, M-31

Description of Exception: Panels M-30 and M-31 are located too close to panel M-1. The correct spacing is 6.5 feet. The simulator spacing is 3.5 feet.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: These panels were added many years after the simulator was first placed in service, and were placed in their current position to avoid moving 32 feet of vertical panels. The only significance of this spacing is that this is the primary entrance into the Unit 1 control room. However, the simulator spacing is large enough to accomodate the control room access gate and this is, therefore, not considered to be a negative impact to training or exams.

Approved: Steve M. Mikal 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: [signature] [signature] 3/5/91
Manager, rator Training (Site) Date

Concurrence: J. Fletcher [illegible] 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

EXCEPTION REPORT
NT-3.02 Attachment 7
Appendix H

Originator: C. E. Scarbrough		Report No. ER-91
Date: 3/4/91	Transferred from SDCR-N/A	SPR-N/A
IC #: N/A	Malfunction #: N/A	Panel #: M-9, M-10

Description of Exception: Panels M-9 and M-10 are not located correctly with respect to the control room centerline.

ANSI/ANS - 3.5 (1985) Reference

Exception Report Time Period Start date 3/1/91 End date N/A

Exception Justification: These panels are located outside and behind the main horseshoe and are not visible from the horseshoe or vertical panel area. Their current location requires the operator to go to approximately the same location to manipulate controls on these panels.

Approved: Steve M. Michael 3/5/91
Manager, Simulator Services (Site) Date

Concurrence: [signature] 3/5/91
Manager, Operator Training (Site) Date

Concurrence: [signature] 3/5/91
Manager, Simulator Programs (NT) Date

Closure Date: _____ Transferred to SDCR-_____ SPR-_____

Closure Approval: _____
Manager, Simulator Services (Site) Date

Closure Concurrence: _____
Manager, Operator Training (Site) Date

TRANSIENT PERFORMANCE TESTS

The following ten abstracts summarize the simulated plant transient tests used to fulfill the requirements of ANSI 3.5 (1985), Part 4.2.1 and Appendix B.2.

Prior to running the transient tests, a general qualitative description of expected plant response to the transients was developed by the TVA Safety Analysis Engineering Group for both the Watts Bar and Sequoyah simulators. This group of engineers is not trained on or otherwise familiar with these simulators and is, therefore, not biased by simulator experience. This analysis is supplemented by calculations done by TVA's Safety Analysis Engineering Group, using RELAP5 performed for several of the ANSI/ANS 3.5 Appendix B transients. These tests are noted in their particular abstracts.

The transient tests were then performed and data collected in accordance with the requirements of the standard. Plots of the appropriate plant parameters as a function of time were reviewed by simulator staff engineers and Operations Training Group simulator instructors. The reviewers compared the measured results against their own expectations and against the transient descriptions obtained from the Safety Analysis Engineering Group. It was concluded that the simulator modeled each of the required transients in an acceptable manner. Affected plant parameters were found to change in the correct direction and magnitude and were consistent with physical laws. During performance of the transient tests, the major anticipated alarms and automatic actions were observed to occur appropriately.

Transient performance data will be collected from the referenced plant (when available) and will replace the qualitative baseline data and calculations used in this initial certification. Actual plant data was used for Transient Test #1, Reactor Trip.

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #1

Procedure Title: Certifying Simulators -
Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: V Ed Kryser Date: 3/6/91

Approved By: J. Fletcher Cobb Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to a manual reactor trip. Malfunction #RP05A "manual reactor trip signal" was used to initiate this test.

1.2 ANS 3.5 Reference: Section 3.1.2, 4.2, and Appendix A3.3 and B2.2.1.

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a 100% power equilibrium initial condition.

3.2 Test Duration and Final Condition: 60 minutes duration, final condition was approaching equilibrium RCS pressure and level and normal zero power SG levels and pressure.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1 (19 total parameters). Each parameter was plotted versus time and all were compared to the baseline performance description.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att 3
Date Conducted: 02/91

4.0 Baseline Data Description: Best-estimate analysis by the Safety Analysis Engineering Group, actual Sequoyah plant reactor trip reports, and RELAP5 model analysis were used for comparison. Test data, best-estimate analysis, and the actual plant data were compared by simulator instructors and simulator engineers. New reactor trip data is used when available from the referenced plant.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: With no operator action, steam generator narrow range levels continue to swell after auxiliary feedwater has recovered levels and shuts off. Plant data shows no swell after auxiliary feedwater terminates. See Discrepancy Report #298.

5.2 Corrective Action Plans/Dates: DR #298 will be corrected by 5/91.

5.3 Exceptions Taken: None

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #2

Procedure Title: Certifying Simulators -
Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Steve M Michal Date: 3/6/91

Reviewed By: V Ed Kaysen Date: 3/6/91

Approved By: J Fletcher Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7 3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to a simultaneous trip of all feedwater pumps. FW05A & B, FW07 A & B malfunctions were inserted to stop all normal and auxiliary feedwater.

1.2 ANS 3.5 Reference: Sections 3.1.2, 4.2, and Appendix A3.3 and B2.2.2.

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a 100% power, equilibrium initial condition.

3.2 Test Duration and Final Condition: 20 minutes duration, final condition was RCS stable but SG level decreasing proportional to steam required to remove decay heat. Steam generators were near 40% wide range level.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1. Each parameter was plotted versus time and all were compared to the baseline performance description.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

4.0 Baseline Data Description: A best estimate analysis by the TVA Safety Analysis Engineering Group was used as baseline reference for this test. This analysis has been evaluated by the simulator instructors and engineering staff at Sequoyah and is the expected referenced plant performance during this transient. A Sequoyah-specific RELAP5 model was also used to obtain performance data for this particular transient. No actual data is available from the referenced plant at this time.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None

5.2 Corrective Action Plans/Dates: None

5.3 Exceptions Taken: None

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #3

Procedure Title: Certifying Simulators -
Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: V Ed Keyser Date: 3/6/91

Approved By: J. Fletcher Cobb Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to simultaneous closure of all MSIV's (manual closure from control board handswitches).

1.2 ANS 3.5 Reference: Sections 3.1.2, 4.2, and Appendix A3.3 and B2.2.3.

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a 100% power, equilibrium initial condition.

3.2 Test Duration and Final Condition: 20 minutes duration, final condition was stable with RCS temperature and SG pressure slightly higher due to the SG PORV relief valve setpoint being higher than normal steam dump system setpoint.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1. Each parameter was plotted versus time and all were compared to the baseline performance description.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

4.0 Baseline Data Description: A best estimate analysis by the TVA Safety Analysis Engineering Group was used as baseline reference for this test. This analysis has been evaluated by the simulator instructors and engineering staff at Sequoyah and is the expected referenced plant performance during this transient. A Sequoyah-specific RELAP5 model was also used to obtain performance data for this particular transient. No actual data is available from the referenced plant at this time.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: With no operator action, steam generator narrow range levels continue to swell after auxiliary feedwater has recovered levels and shuts off. Plant data shows no swell after auxiliary feedwater terminates. See DR #298.

5.2 Corrective Action Plans/Dates: DR #298 will be corrected by 5/91.

5.3 Exceptions Taken: None

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #4

Procedure Title: Certifying Simulators -
Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: V Edl Keyser Date: 3/6/91

Approved By: J. Hutcheson Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to simultaneous trip of all Reactor Coolant Pumps. Inserted malfunctions RCO2A, B, C, D to initiate this test.

1.2 ANS 3.5 Reference: Section 3.1.2, 4.2, and Appendix A3.3 and B2.2.1.

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a 100% power, equilibrium initial condition.

3.2 Test Duration and Final Condition: 20 minutes duration, final condition: Pressurizer pressure above normal because pressurizer sprays are not available, pressurizer level returning to normal, natural circulation established and steam generator pressures on a slow decrease.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1. Each parameter was plotted versus time and all were compared to the baseline performance description.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

4.0 Baseline Data Description: A best estimate analysis by the TVA Safety Analysis Engineering Group was used as baseline reference for this test. This analysis has been evaluated by the simulator instructors and engineering staff at Sequoyah and is the expected referenced plant performance during this transient. A Sequoyah-specific RELAP5 model was also used to obtain performance data for this particular transient. No actual data is available from the referenced plant at this time.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None

5.2 Corrective Action Plans/Dates: None

5.3 Exceptions Taken: None

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #5

Procedure Title: Certifying Simulator -
Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: V Earl Kaysen Date: 3/6/91

Approved By: J. Fletcher Cobb Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to a trip of the Loop #2 Reactor Coolant Pump (RCP)

1.2 ANS 3.5 Reference: Section 3.1.2, 4.2, and Appendix A3.3 and B2.2.5.

2.0 Available and Tested Options

2.1 Description of Available Options: Malfunction RC02 was used. This malfunction allows the tripping of any of the four (RCPs).

2.2 Description of Options Tested: Pump #2 was selected since this is the loop with the pressurizer surge line.

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a 100% power, equilibrium initial condition.

3.2 Test Duration and Final Condition: 20 minutes duration, final condition was stable with #2 SG pressure slightly less than other loops due to reverse flow in the affected steam generator.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1. Each parameter was plotted versus time and all were compared to the baseline performance description.

4.0 Baseline Data Description: A best estimate transient analysis by the TVA Safety Analysis Engineering Group was used as baseline reference for this test. This analysis has been evaluated by the simulator instructors and engineering staff at Sequoyah and is the expected referenced plant performance during this transient. No actual data is available from the referenced plant at this time.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None

5.2 Corrective Action Plans/Dates: N/A

5.3 Exceptions Taken: None

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #6

Procedure Title: Certifying Simulators - Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Dave M. Michael Date: 3/6/91

Reviewed By: V Ed Keyser Date: 3/6/91

Approved By: J. Fletcher Cobb Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 03/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to a manual turbine trip from a power level which does not result in an immediate reactor trip.

1.2 ANS 3.5 Reference: Section 3.1.2, 4.2, and Appendix A3.3 and B3.2.6.

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a reactor power level <P9 (approximately 49%), BOL, steady state for two minutes.

3.2 Test Duration and Final Condition: 20 minutes duration, final plant conditions were Main Feedwater isolated, bypass feedwater flow established, reactor critical and power stable at less than 1%, pressurizer pressure and level returning to program.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1. Each parameter was plotted versus time and all were compared to the baseline performance description.

4.0 Baseline Data Description: A best estimate transient analysis by the TVA Safety Analysis Engineering Group was used as baseline reference for this test. This analysis has been evaluated by the simulator instructors and engineering staff at Sequoyah and is the expected referenced plant performance during this transient. No actual data is available from the referenced plant at this time.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None

5.2 Corrective Action Plans/Dates: N/A

5.3 Exceptions Taken: None

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #7

Procedure Title: Certifying Simulators - Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: V Earl Kryson Date: 3/6/91

Approved By: J. Hutcheson Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to a maximum rate power ramp from 100% reactor power down to approximately 75% and back up to 100%.

1.2 ANS 3.5 Reference: Section 3.1.2, 4.2, and Appendix A3.3 and B2.2.7.

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a 100% power, equilibrium initial condition.

3.2 Test Duration and Final Condition: 20 minutes duration, final condition was at 100% reactor power with all parameters returning to normal.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1. Each parameter was plotted versus time and all were compared to the baseline performance description.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

4.0 Baseline Data Description: A best estimate transient analysis by the TVA Safety Analysis Engineering Group was used as baseline reference for this test. This analysis has been evaluated by the simulator instructors and engineering staff at Sequoyah and is the expected referenced plant performance during this transient. No actual data is available from the referenced plant at this time.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None

5.2 Corrective Action Plans/Dates: N/A

5.3 Exceptions Taken: None

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #8

Procedure Title: Certifying Simulators -
Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: V Ed Kaysen Date: 3/6/91

Approved By: J. Fletcher Gibbs Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to maximum size reactor coolant system rupture combined with loss of all offsite power.

1.2 ANS 3.5 Reference: Section 3.1.2, 4.2, and Appendix A3.3 and B2.2.8.

2.0 Available and Tested Options

2.1 Description of Available Options: Malfunction (TH02) RCS Cold Leg Break at reactor vessel nozzle with malfunction ED01 loss of all offsite AC (161kv and 500kv).

2.2 Description of Options Tested: Selected TH02A, Loop 1 cold leg.

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a 100% power, equilibrium initial condition.

3.2 Test Duration and Final Condition: 20 minutes duration, final condition was ECCS supplying to all four loops and #1 steam generator pressure indicative of failed loop, containment temperature and pressure decreasing.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1. Each parameter was plotted versus time and all were compared to the baseline performance description.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

4.0 Baseline Data Description: A best estimate transient analysis by the TVA Safety Analysis Engineering Group was used as baseline reference for this test. This analysis has been evaluated by the simulator instructors and engineering staff at Sequoyah and is the expected referenced plant performance during this transient. No actual data is available from the referenced plant at this time.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None

5.2 Corrective Action Plans/Dates: N/A

5.3 Exceptions Taken: None

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #9

Procedure Title: Certifying Simulators -
Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Steve M. Michal Date: 3/6/91

Reviewed By: V Ed Keyser Date: 3/6/91

Approved By: J. Fletcher Cobb Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to maximum size unisolable main steam line rupture.

1.2 ANS 3.5 Reference: Section 3.1.2, 4.2, and Appendix A3.3 and B2.2.9.

2.0 Available and Tested Options

2.1 Description of Available Options: Malfunction MS01 (Main Steam Line Break Inside Containment at selected severity where 100% = 3E6#/hr @ 750 PSID.)

2.2 Description of Options Tested: Selected MS01A, Loop 1 at 100% severity.

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a 100% power, equilibrium initial condition.

3.2 Test Duration and Final Condition: 20 minutes duration, final condition was: containment pressure decreasing to normal, pressurizer pressure increasing to the PORV setpoint after the pressurizer goes solid, Loop #1 steam generator depressurized.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1. Each parameter was plotted versus time and all were compared to the baseline performance description.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

4.0 Baseline Data Description: A best estimate transient analysis by the TVA Safety Analysis Engineering Group was used as baseline reference for this test. This analysis has been evaluated by the simulator instructors and engineering staff at Sequoyah and is the expected referenced plant performance during this transient. No actual data is available from the referenced plant at this time.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None

5.2 Corrective Action Plans/Disposition: N/A

5.3 Exceptions Taken: None

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Transient Test #10

Procedure Title: Certifying Simulators -
Simulator Transient Performance Test

Procedure Number: NT-P-7.3.1-8, Attachment 4

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: Ved Kapoor Date: 3/6/91

Approved By: J. Fletcher Cobb Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Transient response to slow primary system depressurization to saturated conditions using a f·'led open Pressurizer safety valve with no high pressure Emergency Core Cooling System available.

1.2 ANS 3.5 Reference: Section 3.1.2, 4.2, and Appendix A3.3 and B2.2.10,

2.0 Available and Tested Options

2.1 Description of Available Options: Used malfunction TH04, mechanical failure of a Pressurizer Safety Valve, selectable between the three safety valves. The magnitude of the failure can be controlled between zero and 100% of total safety valve capacity at 2500 psid.

2.2 Description of Options Tested: Used TH04A to fail Pressurizer Safety Valve 68-563 at 100% open and defeated Centrifugal Charging Pump operation by insertion of malfunctions CV01A and B.

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Started from a 100% power, equilibrium initial condition.

3.2 Test Duration and Final Condition: 20 minutes duration, final condition: pressurizer at 100% level, RCS saturated at no load RCS temperature.

3.3 Data Collection Description

3.3.1 Sample Rate: Two samples/second

3.3.2 Test Parameter Description: All items in ANS 3.5, Appendix B.2.1. Each parameter was plotted versus time and all were compared to the baseline performance description.

4.0 Baseline Data Description: A best estimate analysis by the TVA Safety Analysis Engineering Group was used as baseline reference for this test. This analysis has been evaluated by the simulator instructors and engineering staff at Sequoyah and is the expected referenced plant performance during this transient. A Sequoyah-specific RELAP5 model was also used to obtain performance data for this particular transient. No actual data is available from the referenced plant at this time.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: Steam generator wide range level increases off-scale high. See DR #010.

5.2 Corrective Action Plans/Dates: The correction to DR #010 caused this problem. DR #010 was reworked and the original problem is now corrected and DR #010 has been closed.

5.3 Exceptions Taken: None

STEADY STATE TEST OVERVIEW

The following four tests meet the intent of ANSI 3.5 (1985) part 4.1 for simulator accuracies at steady state conditions.

Prior to test performance, a collective effort by simulator engineers and Operator Training at both Sequoyah and Watts Bar produced a list of critical and non-critical parameters. These parameters were chosen using EPRI guidelines and the ANSI 3.5 critical parameter definition. Consideration was given to the minimum indications needed by the operator to make immediate decisions during normal and abnormal plant evolutions.

Each test was then performed by collecting simulator data for critical and non-critical parameters. These simulator data values were compared to baseline values collected from the Sequoyah plant process computer and control room observations.

The following is a list of the critical and non-critical parameters used on this initial certification.

SEQUOYAH NUCLEAR PLANT

CRITICAL PARAMETERS

Instrument Number	Parameter Description
EI-57-16A	Unit Generator Gross MW
TR-68-2BP01	RC Tref
LR-68-339	Pressurizer 1 L
PI-68-340A	Pressurizer 1 P
FI-68-6A	RCL1 1 F
FI-68-29A	RCL2 1 F
FI-68-48A	RCL3 1 F
FI-68-71A	RCL4 1 F
LI-3-42	Stm Gen 1 Nar Rng 1 L
LI-3-55	Stm Gen 2 Nar Rng 1 L
LI-3-97	Stm Gen 3 Nar Rng 1 L
LI-3-110	Stm Gen 4 Nar Rng 1 L
SC-CBDG-1&2	D4200 Rod Position (1-53) to CR
FI-3-35A	Stm Gen 1 Feed Wtr In 1 F
FI-3-48A	Stm Gen 2 Feed Wtr In 1 F
FI-3-90A	Stm Gen 3 Feed Wtr In 1 F
FI-3-103A	Stm Gen 4 Feed Wtr In 1 F
FI-1-3	Stm Gen 1 Stm Out 1 F
FI-1-10	Stm Gen 2 Stm Out 1 F
FI-1-21	Stm Gen 3 Stm Out 1 F
FI-1-28	Stm Gen 4 Stm Out 1 F
NI-41B	Pwr Rng Channel 1 (Quad 4) Q
NI-42B	Pwr Rng Channel 2 (Quad 2) Q
NI-43B	Pwr Rng Channel 3 (Quad 1) Q
NI-44B	Pwr Rng Channel 4 (Quad 3) Q
TI-68-1	RCL1 Wide Rng Hot Leg T
TI-68-24	RCL2 Wide Rng Hot Leg T
TI-68-43	RCL3 Wide Rng Hot Leg T
TI-68-65	RCL4 Wide Rng Hot Leg T
TI-68-18	RCL1 Wide Rng Cold Leg T
TI-68-41	RCL2 Wide Rng Cold Leg T
TI-68-60	RCL3 Wide Rng Cold Leg T
TI-68-83	RCL4 Wide Rng Cold Leg T
PI-62-92A	Charg Pmp Disch Hdr Press
PI-1-2A	Stm Gen 1 Stm Out 1 P
PI-1-9A	Stm Gen 2 Stm Out 1 P
PI-1-20A	Stm Gen 3 Stm Out 1 P
PI-1-27A	Stm Gen 4 Stm Out 1 P
PI-1-33	Stm Line Hdr P
PI-3-34	Feedwater Htrs 1 Outlet Hdr P
TI-68-2BP02	RCL Highest T-Avg. (Auctioneer)

SEQUOYAH NUCLEAR PLANT

NON-CRITICAL PARAMETERS

Instrument Number	Parameter Description
PI-70-24	03600 CCS HX A In Press
FI-62-93	28170 Chrg Hdr Flow Cont
FI-62-82	28190 Let Dwn Flow Indicator
MOD52196/1	09010 125v dc Bat Bd Voltage
EI-57-96/2	09010 125v dc Bat Bd Voltage
EI-57-96/3	09010 125v dc Bat Bd Voltage
EI-57-96/4	09010 125v dc Bat Bd Voltage
EI-57-99	10240 50v dc Batt Voltage
EI-57-29	10140 480v SD BD 1A1-A Voltage
EI-57-30	10140 480v SD BD 1A2-A Voltage
EI-57-83	10150 480v SD BD 1B1-B Voltage
EI-57-84	10150 480v SD BD 1B2-B Voltage
EI-57-39	10120 6.9 kV SD-BD 1A-A Voltage
EI-57-66	10130 6.9 kV SD-BD 1B-B Voltage
EI-57-18	07050 500 kV Bus Voltage
PI-1-33	05300 Main Stm 48" Hdr Press
LI-68-367	Reac Lvl Wide Range
LI-68-368	Reac Lvl Narrow Range
LI-68-369	Reac Lvl Plenum
FI-67-61	08030 ERCW Supply Header A Flow
FI-67-62	08030 ERCW Supply Header B Flow
TI-68-2E	05250 RCS Loop 1 T-Avg
TI-68-25E	05250 RCS Loop 2 T-Avg
TI-68-44E	05250 RCS Loop 3 T-Avg
TI-68-67E	05250 RCS Loop 4 T-Avg
TI-68-2D	05250 RCS Loop 1 Delta-T
TI-68-25D	05250 RCS Loop 2 Delta-T
TI-68-44D	05250 RCS Loop 3 Delta-T
TI-68-67D	05250 RCS Loop 4 Delta-T
TI-68-2A	05250 RCS Loop 1 Overpwr Delta-T
TI-68-25A	05250 RCS Loop 2 Overpwr Delta-T
TI-68-44A	05250 RCS Loop 3 Overpwr Delta-T
TI-68-67A	05250 RCS Loop 4 Overpwr Delta-T
TI-68-2B	05250 RCS Loop 1 Overtemp Delta-T
TI-68-25B	05250 RCS Loop 2 Overtemp Delta-T
TI-68-44B	05250 RCS Loop 3 Overtemp Delta-T
TI-68-67B	05250 RCS Loop 4 Overtemp Delta-T
LI-63-129	09010 SIS Accum Tk 1 Level
LI-63-109	09010 SIS Accum Tk 2 Level
LI-63-89	09030 SIS Accum Tk 3 Level
LI-63-82	09030 SIS Accum Tk 4 Level
LI-63-50	09010 SIS RWST Level Ind
PI-63-108	09010 SIS Accum Tk 2 Press
PI-63-128	09010 SIS Accum Tk 1 Press
PI-63-88	09030 SIS Accum Tk 3 Press
PI-63-62	09030 SIS Accum Tk 4 Press
LI-68-300	RCS PRT Level
LI-3-43	05100 Stm Gen #1 Wide Rng Lvl Ind
LI-3-56	05100 Stm Gen #2 Wide Rng Lvl Ind
LI-3-98	05100 Stm Gen #3 Wide Rng Lvl Ind
LI-3-111	05100 Stm Gen #4 Wide Rng Lvl Ind
PI-68-301	RCS PRT Press
TI-68-309	RCS PRT Temp
EI-57-15	Generator Volts
EI-57-8	Gen MVAR
PI-3-1	05300 FW Htr Supply Hdr Press

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: 100% Steady State Test

Procedure Title: Certifying Simulators - Simulator Steady-State Test

Procedure Number: NT-P-7.3.1-8, Attachment 2

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: V Ed Keyser Date: 3/6/91

Approved By: J Gordon Cotts Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 2
Date Conducted: 03/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: 100% Steady State Test, evaluate stability of IC and correctness of Initial Condition values.

1.2 ANS 3.5 Reference: Section 4.1, Appendix A3.2 and B2.1

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: 100% power, equilibrium

3.2 Test Duration and Final Condition: 100% power equilibrium for one minute then freeze simulation and collect all critical and non-critical parameters.

3.3 Data Collection Description

3.3.1 Sample Rate: One collection after one minute.

3.3.2 Test Parameter Description: Monitored the critical parameters and non-critical parameters listed under the Steady-State Overview tab.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 2
Date Conducted: 03/91

4.0 Baseline Data Description: Baseline data derived from (1) actual plant data, when available; (2) current revisions of Heat Balance drawings, Plant Instructions, FSAR, Instrument Tabs; and (3) as a last resort, estimated values. Each data point was verified to be within 2% of simulated critical parameters and within 10% of simulated non-critical parameters.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #291 was written to adjust the background radiation readings for several of the radiation monitors.

5.2 Corrective Action Plans/Dates: DR #291 will be closed by 8/1/91. This will include minor software adjustments to all radiation background indications.

5.3 Exceptions Taken: N/A

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: 73% Steady State Test

Procedure Title: Certifying Simulators - Simulator Steady State Test

Procedure Number: NT-P-7.3.1-8 Attachment 2

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: Ed Keyser Date: 3/6/91

Approved By: J. Fletcher Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 2
Date Conducted: 03/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: 73% Steady State Test, evaluate stability and correctness of Initial Conditions values.

1.2 ANS 3.5 Reference: Section 4.1, Appendix A.3.2 and B.2.1

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: 75% power and equilibrium, then simulator was operated down to 73% power where actual plant data exists.

3.2 Test Duration and Final Condition: 73% power equilibrium for one minute, freeze simulation and collect all critical and non-critical parameters.

3.3 Data Collection Description

3.3.1 Sample Rate: One collection after one minute.

3.3.2 Test Parameter Description: Monitored the critical parameters and non-critical parameters listed under the Steady-State Overview tab.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 2
Date Conducted: 03/91

4.0 Baseline Data Description: Baseline data derived from (1) actual plant data, when available; (2) current revisions of Heat Balance drawings, Plant Instructions, FSAR, Instrument Tabs; and (3) as a last resort, estimated values. Each data point was verified to be within 2% of simulated critical parameters and within 10% of simulated non-critical parameters.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #291 was written to adjust the background radiation readings for several of the radiation monitors.

5.2 Corrective Action Plans/Dates: DR #291 will be closed before 8/1/91. This will include minor software adjustments to all radiation background indications.

5.3 Exceptions Taken: N/A

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: 50% Steady State Test

Procedure Title: Certifying Simulator - Simulator Steady State Test

Procedure Number: NT-P-7.3.1-8, Attachment 2

Scheduled Frequency: Annual

Prepared By: Steve M Michael Date: 3/6/91

Reviewed By: V Ed Keyser Date: 3/6/91

Approved By: J Hutcheson Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 2
Date Conducted: 03/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: 50% Steady State Test evaluate stability and correctness of Initial Condition values.

1.2 ANS 3.5 Reference: Section 4.1, Appendix A.3.2, B.2.1

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: 50% power equilibrium

3.2 Test Duration and Final Condition: 50% power equilibrium for one minute, freeze simulation, and collect all critical and non-critical parameters.

3.3 Data Collection Description

3.3.1 Sample Rate: one collection after one minute.

3.3.2 Test Parameter Description: Monitored the critical parameters and non-critical parameters listed under the Steady-State Overview tab.

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 2
Date Conducted: 03/91

4.0 Baseline Data Description: Baseline data derived from (1) actual plant data, when available; (2) current revisions of Heat Balance drawings, Plant Instructions, FSAR, Instrument Tabs; and (3) as a last resort, estimated values. Each data point was verified to be within 2% of simulated critical parameters and within 10% of simulated non-critical parameters.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #291 was written to adjust the background radiation readings for several of the radiation monitors.

5.2 Corrective Action Plans/Dates: DR #291 will be closed by 8/1/91. This will include minor software adjustments to all radiation background indications.

5.3 Exceptions Taken: N/A

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Stability Test (Drift)

Procedure Title: Certifying Simulators
Simulator Steady-State Test

Procedure Number: NT-P-7.3.1-8, Attachment 2

Scheduled Frequency: Annual

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: V Ed Kryston Date: 3/6/91

Approved By: J Hutcheson Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 2
Date Conducted: 03/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Collect critical parameters for one hour and ensure simulated variables do not drift more than ± two percent. This should prove the stability of the initial condition.

1.2 ANS 3.5 Reference: Section 4.1

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: N/A

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: 100% power equilibrium

3.2 Test Duration and Final Condition: 60 minutes duration with tested parameters in a final condition not more than ± two percent of initial condition.

3.3 Data Collection Description

3.3.1 Sample Rate: 1 sample/second

3.3.2 Test Parameter Description : All critical parameters monitored in steady-state test. Each parameter was plotted for one hour and each plot was determined to be within 2% of initial value.

NT-P-7.3.1-8
Appendix D
Performance Test Abstract
Procedure Number: NT-P-7.3.1-8, Att 2
Date Conducted: 03/91

4.0 Baseline Data Description: Within ± 2 % of the initial condition values determined in the 100% steady-state test. Actual data and simulator plots remain on file for duration of certification test cycle.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None

5.2 Corrective Action Plans/Dates: N/A

5.3 Exceptions Taken: None

PROCEDURES TEST OVERVIEW

The following four abstracts summarize the tests used to meet the intent of ANSI 3.5 (1985), parts 3.1.1, 3.3.1, and 3.3.2. By testing the use of Normal and Abnormal instructions, the simulator capabilities for "Normal Plant Evolutions" and "Systems Simulated and The Degree of Completeness" can be validated.

The first two periodic tests validate normal operations in which the simulator was taken from a cold shutdown condition to 100% power and then operated back down to cold shutdown. All operations were performed from the same initial condition (IC) and with actual plant instructions (controlled copies).

The remaining two tests validate Emergency and Abnormal Operating Instructions. Each instruction was validated by selecting the appropriate IC, malfunction, and/or local operator action to force the simulator response needed.

Instructors and operators validated that each associated instruction could be performed on the simulator and, as necessary, each indication, control switch, and dynamic response was available to the trainee. The instructor station was also verified to have all necessary "local operator actions" to allow performance of appropriate instruction steps.

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: General Operating Instructions (GOIs) [1]

Procedure Title: Certifying Simulators - Normal and Abnormal Operating Plant Instructions Test

Procedure Number: NT-P-7.3.1-8, Attachment 3

Scheduled Frequency: Four-year cycle (first year)

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: Ed Keyser Date: 3/6/91

Approved By: J. Fletcher Cobb Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 01/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: To ensure all General Operating Instructions (GOIs) and associated plant instructions necessary for simulator training may be adequately performed on the simulator. This proves that the simulator can be started from cold shutdown and taken to 100% power using controlled plant instructions.

1.2 ANS 3.5 Reference: Section 3, paragraph 1, section 3.1.1, Appendix A1.4 and A3.2(2).

2.0 Available and Tested Options

2.1 Description of Available Options: Identify and test all plant procedures that are used while performing normal plant evolutions and that have a simulator training value.

2.2 Description of Options Tested: Tested all instructions listed in the attached table. Each instruction tested was latest revision level from the plant controlled copies. These same instructions are the ones used on the simulator for training.

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Depended on instruction. Evaluator initiated simulator at a condition representing the beginning of the procedure being tested and performed all necessary steps.

3.2 Test Duration and Final Condition: Performance continued until the instruction ended or transitioned to another instruction.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 01/91

4.0 Baseline Data Description: Simulator instructors and simulator engineers assured that all necessary controls and indications were available to use all necessary procedures and instructions. Baseline data was the actual controlled plant instructions.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: Discrepancy Report (DR) #119 was written to adjust temperature response in the pressurizer surge line when pressure heaters are turned on. DR #166 was written to adjust the main feedwater bypass valve position to agree with GOI 2, step c.88. The procedure says valve should be approximately 60% open, but simulator shows approximately 76-86% open.

5.2 Corrective Action Plans/Dates: DR #119 will be corrected by 6/1/91; there is no negative impact to training. DR #166 will be corrected by tuning valve admittances and will be closed by 5/1/91; there is no negative training impact.

5.3 Exceptions Taken: None

NT-P-7.3.1-8, Attachment 3

Table 2 - Specific Plant Instructions to be Performed as Part of Test #1 Table 1

Plant - Unit SQN-1

Item Number	Instruction Number	Revision Level	Date Performed	Name of Operator(s)
1	GOI-1	87	01/91	V. E. Keyser/B. C. Lake
2	GOI-2	70	01/91	V. E. Keyser/B. C. Lake
3	GOI-5	44	01/91	V. E. Keyser/B. C. Lake
4	SOI-2.1&3.1	55	01/91	V. E. Keyser/B. C. Lake
5	SOI-74.1	56	01/91	V. E. Keyser/B. C. Lake

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: General Operating Instructions (GOIs) [2]

Procedure Title: Certifying Simulators - Normal and Abnormal Operating Plant Instructions Test

Procedure Number: NT-P-7.3.1-8, Attachment 3

Scheduled Frequency: Four-year cycle (second year)

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: Ed Kenyon Date: 3/6/91

Approved By: J. Fletcher (acting) Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 01/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: To ensure all General Operating Instructions (GOIs) and associated plant instructions necessary for simulator training may be adequately performed on the simulator. This proves that the simulator can be started from cold shutdown and taken to 100% power using controlled plant instructions.

1.2 ANS 3.5 Reference: Section 3, paragraph 1, section 3.1.1 Appendix A1.4 and A3.2(2).

2.0 Available and Tested Options

2.1 Description of Available Options: Identify and test all plant procedures that are used while performing normal plant evolutions and that have a simulator training value.

2.2 Description of Options Tested: Tested all instructions listed in the attached table. Each instruction tested was latest revision level from the plant controlled copies. These same instructions are the ones used on the simulator.

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Depended on instruction. Evaluator initiated simulator at a condition representing the beginning of the procedure being tested and performed all necessary steps.

3.2 Test Duration and Final Condition: Performance continued until the instruction ended or transitioned to another instruction.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 01/91

4.0 Baseline Data Description: Simulator instructors and simulator engineers assured that all necessary controls and indications were available to use all necessary procedures and instructions. Baseline data was the actual controlled plant instructions.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: Discrepancy Report (DR) #87 was written to adjust Moisture Separator Reheater temperature response when the MSR steam valves were closed. DR #88 was written to correct the turbine eccentricity recorder indication. DR #90 was written to adjust Reactor Coolant System response to boron injection. It appears that boron concentration change is faster than expected.

5.2 Corrective Action Plans/Dates: DR #87 and #88 will be corrected by 5/1/91; there is no negative training impact. DR #90 is being evaluated and will be corrected as a high priority by 4/1/91.

5.3 Exceptions Taken: None

NT-P-7.3.1-B, Attachment 3

Table 3 - Specific Plant Instructions to be Performed as Part of Test #2 Table 1

Plant - Unit SQN-1

Item Number	Instruction Number	Revision Level	Date Performed	Name of Operator
1	GOI-5	44	01/91	V. E. Keyser/B. C. Lake
2	SOI-2.1&3.1	55	01/91	V. E. Keyser/B. C. Lake
3	SOI-27.1	11	01/91	V. E. Keyser/B. C. Lake
4	GOI-3	47	01/91	V. E. Keyser/B. C. Lake
5	SO-5-1	0	01/91	V. E. Keyser/B. C. Lake
6	SOI-202.3	1	01/91	V. E. Keyser/B. C. Lake
7	SI-760	1	01/91	V. E. Keyser/B. C. Lake
8	SOI-47.3	9	01/91	V. E. Keyser/B. C. Lake
9	SOI-65.1	24	01/91	V. E. Keyser/B. C. Lake
10	SOI-74.1	56	01/91	V. E. Keyser/B. C. Lake
11	SI-7	49	01/91	V. E. Keyser/B. C. Lake
12	SO-68-2	0	01/91	V. E. Keyser/B. C. Lake

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Emergency Instructions

Procedure Title: Certifying Simulators - Normal and Abnormal Operating Plant Instructions Test

Procedure Number: NT-P-7.3.1-8, Attachment 3

Scheduled Frequency: Four-year cycle (third year)

Prepared By: Steve M Michael Date: 3/6/91

Reviewed By: Ed Keyser Date: 3/6/91

Approved By: J. Hutcheson Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Ensure that the controlled copies of the Emergency Instructions, Emergency Contingency Actions and Functional Restoration Guidelines can be adequately performed on the simulator.

1.2 ANS 3.5 Reference: Section 3, paragraph 1, section 3.1.2, Appendix A14 and A3.2(2).

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: All Emergency Instructions listed in the attached table were performed. The "ACTION/EXPECTED RESPONSE" steps and most "RESPONSE NOT OBTAINED" steps were performed for each Emergency Instruction.

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Most instructions were initiated by a malfunction entered from a 100% equilibrium IC. Instructor/evaluator operated the simulator to obtain conditions applicable to the Emergency Instructions.

3.2 Test Duration and Final Condition: Each instruction was performed until completed and its final transition to another procedure was encountered.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

4.0 Baseline Data Description: Best estimate by simulator instructors and simulator engineers that all necessary controls were available to use all procedures and proper indications were observed. Baseline data was the actual controlled plant instruction.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: Discrepancy Report (DR) #224 was written to correct the handswitch operation for ERCW valves to the component cooling heat exchangers used during ES-1.2. DR #225 was written to correct steam generator level response during FR-H.1. DR #255 was written to change a reactor coolant pump seal isolation valve from an open/close valve to a variable position valve during ECA-0.1. DR #259 was written to increase the makeup flow to the refueling water storage tank when using ECA-3.2 and remote function CVR05.

5.2 Corrective Action Plans/Dates: DR #224 will be worked by 5/1/91. DR #225 is completed and tested. DR #255 will be worked by 5/1/91. DR #259 will be worked by 5/1/91. None of the above DRs has a significant impact to training and are considered minor problems.

5.3 Exceptions Taken: None.

NT-P-7.3.1-8, Attachment 3

Table 4 - Specific Plant Instructions to be Performed as Part of Test #3 Table 1

Plant - Unit SQN-1

Item Number	Instruction Number	Revision Level	Date Performed	Name of Operator
1	FR-0	7	02/91	V. E. Keyser
2	FR-S.1	7	02/91	V. E. Keyser
3	FR-S.2	2	02/91	V. E. Keyser
4	FR-C.1	5	02/91	V. E. Keyser
5	FR-C.2	3	02/91	V. E. Keyser
6	FR-H.1	5	02/91	V. E. Keyser
7	FR-H.2	3	02/91	V. E. Keyser
8	FR-H.3	4	02/91	V. E. Keyser
9	FR-H.4	3	02/91	V. E. Keyser
10	FR-H.5	2	02/91	V. E. Keyser
11	FR-P.1	6	02/91	B. C. Lake
12	FR-P.2	4	02/91	V. E. Keyser
13	FR-Z.1	6	02/91	V. E. Keyser
14	FR-Z.2	3	02/91	V. E. Keyser
15	FR-Z.3	4	02/91	V. E. Keyser
16	FR-I.1	3	02/91	B. C. Lake
17	FR-I.2	2	02/91	B. C. Lake
18	FR-I.3	5	02/91	V. E. Keyser
19	E-0	10	02/91	V. E. Keyser
20	ES-0.1	13	02/91	V. E. Keyser

Table 4 - Specific Plant Instructions to be Performed as Part of Test #3 Table 1

Plant - Unit SQN-1

Item Number	Instruction Number	Revision Level	Date Performed	Name of Operator
21	ES-0.2	6	02/91	V. E. Keyser
22	ES-0.3	8	02/91	V. E. Keyser
23	E-1	9	02/91	V. E. Keyser
24	ES-1.1	4	02/91	V. E. Keyser
25	ES-1.2	1	02/91	V. E. Keyser
26	ES-1.3	3	N/A	Not performed
27	E-2	6	02/91	V. E. Keyser
28	E-3	7	02/91	V. E. Keyser
29	ES-3.1	6	02/91	V. E. Keyser
30	ES-3.2	4	02/91	V. E. Keyser
31	ES-3.3	4	02/91	V. E. Keyser
32	E-FOP	7	02/91	V. E. Keyser
33	ECA-0.0	5	02/91	V. E. Keyser
34	ECA-0.1	3	02/91	V. E. Keyser
35	ECA-0.2	2	02/91	V. E. Keyser
36	ECA-1.1	5	02/91	V. E. Keyser
37	ECA-1.2	3	02/91	V. E. Keyser
38	ECA-2.1	3	02/91	B. C. Lake
39	ECA-3.1	3	02/91	V. E. Keyser
40	ECA-3.2	5	02/91	V. E. Keyser

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Abnormal Operating Instructions

Procedure Title: Certifying Simulators - Normal and Abnormal Operating Plant Instructions Test

Procedure Number: NT-P-7.3.1-8, Attachment 3

Scheduled Frequency: Four-year cycle (fourth year)

Prepared By: Steve M. Michael Date: 3/6/91

Reviewed By: Ed Kaysen Date: 3/6/91

Approved By: J. Fletcher Cotts Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

1.0 Test Description and ANS 3.5 References.

1.1 Description: Ensure the applicable portions of the Abnormal Operating Instructions (AOIs) can be performed on the simulator. Verify all necessary remote operations can be performed from Instructor Station during use of the AOIs.

1.2 ANS 3.5 Reference: Section 3, paragraph 1, section 3.1.2, Appendix A1.4 and A3.2(2)

2.0 Available and Tested Options

2.1 Description of Available Options: N/A

2.2 Description of Options Tested: All AOIs listed in the attached table were performed. All steps deemed appropriate by the test team were performed for each AOI listed. Each step was checked off on a copy of the latest revision and such documentation is maintained as test data.

3.0 Test Conditions and Parameters

3.1 Initial Condition Description: Most instructions were initiated by a malfunction entered from 100% power, equilibrium conditions. The evaluator initiated the simulator in a condition representing the beginning of the procedure being tested and performed all possible instruction steps.

3.2 Test Duration and Final Condition: Performance continued until allowed by procedure to leave the AOI and return to normal instructions or until the AOI was completed.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

NT-P-7.3.1-8
Appendix D
Certification Test Abstracts
Procedure Number: NT-P-7.3.1-8, Att. 3
Date Conducted: 02/91

4.0 Baseline Data Description: Best estimate by simulator instructors and simulator engineers that all necessary controls were available to use all procedures and proper indications were observed.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: Discrepancy Report (DR) #239 was written against AOI 10 to correct the failure position of eight air valves during the loss of instrument air. DR #240 and #243 were written against AOI 25 to correct minor power supply problems to individual 120v AC powered valves and meters. DR #246 and #248 were written against AOI 21 to request enhancements to the model by adding or modifying local operator actions.

5.2 Corrective Action Plans/Dates: DRs 239, 240, and 243 are considered minor corrections and will be completed by 5/1/91. There is no negative training impact due to the occurrence of these problems. DR #246 and #248 are instructor-requested enhancements and will be added by 6/1/91.

5.3 Exceptions Taken: None

Table 5 - Specific Plant Instructions to be Performed as Part of Test #4 Table 1

Plant - Unit SQN-1

Item Number	Instruction Number	Revision Level	Date Performed	Name of Operator
1	AOI-1 (Cancelled)	21	N/A	Not performed
2	AOI-2	14	02/91	B. C. Lake
3	AOI-3	8	02/91	V. E. Keyser
4	AOI-4	12	02/91	V. E. Keyser
5	AOI-5	13	02/91	V. E. Keyser
6	AOI-6	27	02/91	V. E. Keyser
7	AOI-7	19	02/91	V. E. Keyser
8	AOI-8	19	02/91	V. E. Keyser
9	AOI-9	12	02/91	V. E. Keyser
10	AOI-10	15	02/91	B. C. Lake
11	AOI-11	6	02/91	B. C. Lake
12	AOI-12	7	02/91	V. E. Keyser
13	AOI-13	10	02/91	V. E. Keyser
14	AOI-14	13	02/91	V. E. Keyser
15	AOI-15	15	02/91	V. E. Keyser
16	AOI-16	11	02/91	B. C. Lake
17	AOI-17	15	02/91	V. E. Keyser
18	AOI-18	10	02/91	B. C. Lake
19	AOI-19 (Cancelled)	15	N/A	Not performed
20	AOI-20	8	02/91	B. C. Lake
21	AOI-21.1	13	02/91	B. C. Lake
22	AOI-21.2	14	02/91	B. C. Lake
23	AOI-21.3	9	02/91	V. E. Keyser
24	AOI-21.4	9	02/91	V. E. Keyser
25	AOI-21.5	7	N/A	Not performed (unit 2)

Table 5 - Specific Plant Instructions to be Performed as Part of Test #4 Table 1

Plant - Unit SQN-1

Item Number	Instruction Number	Revision Level	Date Performed	Name of Operator
26	AOI-21.6	8	N/A	Not performed (unit 2)
27	AOI-21.7	10	N/A	Not performed (unit 2)
28	AOI-21.8	10	N/A	Not performed (unit 2)
29	AOI-22	7	02/91	B. C. Lake
30	AOI-23	7	02/91	V. E. Keyser
31	AOI-24	10	02/91	V. E. Keyser
32	AOI-25.1	6	02/91	B. C. Lake
33	AOI-25.2	6	02/91	B. C. Lake
34	AOI-25.3	7	02/91	B. C Lake
35	AOI-25.4	6	02/91	B. C. Lake
36	AOI-25.5	4	N/A	Not performed (unit 2)
37	AOI-25.6	5	N/A	Not performed (unit 2)
38	AOI-25.7	4	N/A	Not performed (unit 2)
39	AOI-25.8	4	N/A	Not performed (unit 2)
40	AOI-26	2	02/91	B. C. Lake
41	AOI-27	18	02/91	B. C. Lake
42	AOI-28	3	02/91	V. E. Keyser
43	AOI-29	5	02/91	V. E. Keyser
44	AOI-30	9	02/91	V. E. Keyser
45	AOI-31	7	02/91	V. E. Keyser
46	AOI-32	2	02/91	V. E. Keyser
47	AOI-33 (Cancelled)	3	N/A	Not performed
48	AOI-34	6	02/91	V. E. Keyser
49	AOI-35	12	02/91	V. E. Keyser
50	AOI-36 (Cancelled)	2	N/A	Not performed

MALFUNCTION TESTING OVERVIEW

The following abstract summarizes the test to meet the intent of ANSI/ANS-3.5 (1985), part 3.1.2.

The Sequoyah simulator malfunction set represents malfunctions developed from the experience of over 14 years of operator training and examinations given by the Sequoyah Training Department. Industry experience, curriculum review committees, and examiner request have also been used to improve the malfunction set. Since a major computer and software upgrade has just been completed for the Sequoyah simulator, all malfunctions have been reviewed by simulator engineers and most have been thoroughly tested by either specific malfunction tests or through use during other performance tests.

A total of 44 malfunctions, representing at least one from each type required by ANSI 3.5, were tested. Prior to each test, the Malfunction Cause and Effects (MC&E) document was reviewed by test personel to identify anticipated simulator responses and to consider appropriate operator actions. The simulator was then initialized to an appropriate Initial Condition and the malfunction was inserted. Test personnel observed the simulator responses and took actions where appropriate.

The following table lists the malfunctions tested during this initial certification and breaks down the annual test schedule for individual malfunctions over the next four years.

(NT-3.02, Attachment 6)

TABLE 1 - Malfunction List and Certification Test Schedule

PLANT - UNIT SQN-1

Baseline Data Source Malfunction Cause and Effects

Annual Test Period	Item No.	Malfunction Description		ANS 3.5 Section 3.1.2 Reference	Test Schedule	
		Malfunction Definition	Malf Name		Planned Completion	Actual Completion
1	1	VCT Level Transmitter Fails Hi	CV09	3.1.2(18)		1/30/91
	2	Steam Generator Tube Leak	TH05	3.1.2(1a)		1/15/91
	3	Letdown Line Break Inside Auxiliary Building	CV04	3.1.2(1b)		1/17/91
	4	LOCA Small Leak	TH03	3.1.2(1c)		1/16//91
	5	Pressurizer Safety Failure	TH04	3.1.2(1d)		1/17/91
	6	Stuck Rod	RD13	3.1.2(12)		N/A
	7	Loss of non-essential control air	1A02	3.1.2(2)		1/28/91
	8	Total Loss of Offsite Power	ED01	3.1.2(3)		1/25/91
	9	Loss of 6.9kv Shutdown Board	ED06	3.1.2(3)		1/24/91
	10	Loss of 480v Shutdown	ED08	3.1.2(3)		1/24/91
2	1	Loss of 250 vdc Batt Bd	ED15	3.1.2(3)		2/4/91
	2	RCP Locked Rotor	RC01	3.1.2(4)		2/17/91
	3	RCCA Misalignment	RD05	3.1.2(12)		1/31/91
	4	RCW Pump Trip	RW02	3.1.2(6)		1/25/91
	5	Loss of cooling to MFP oil coolers	RW07	3.1.2(6)		2/5/91
	6	RHR Loop Suction Line Blockage	RH04	3.1.2(7)		2/21/91
	7	Reactor Trip Signal Failure	RP01	3.1.2(24)		1/31/91
	8	Component Cooling Pipe Break Inside Containment	CC04	3.1.2(8)		2/5/91
	9	Condensate Booster Pump Trip	CN02 a, b, c	3.1.2(9)		1/25/91
	10	Main Steam Line Break Inside Containment	MS01	3.1.2(20)		2/4/91
	11	Loss of All Feedwater ° Trip of Turbine MFWP ° Trip of AFWP	FW05a,b FW07 a, b, c	3.1.2(10)		2/4/91

(NT-3.02, Attachment 6)

TABLE 1 - Malfunction List and Certification Test Schedule

PLANT - UNIT SQN-1

Baseline Data Source Malfunction Cause and Effects

Annual Test Period	Item No.	Malfunction Description		ANS 3.5 Section 3.1.2 Reference	Test Schedule	
		Malfunction Definition	Malf Name		Planned Completion	Actual Completion
3	1	LOCA Hot Leg	TH01	3.1.2(1C)		2/21/91
	2	Main Turbine Hi Vibes	TU02	3.1.2(15)		1/31/91
	3	Main Generator Trip	EG01	3.1.2(16)		1/29/91
	4	Loss of 120 VAC Inverter	ED10	3.1.2(3,11)		1/28/91
	5	T-avg. Control Signal Fails	RX18	3.1.2(17)		1/29/91
	6	Pzr pressure Transmitter Fails Hi	RX07	3.1.2(18) 3.1.2(25)		1/29/91
	7	RHR Pump Trip	RH01	3.1.2(7)		1/25/91
	8	False Auto Reactor Trip Signal	RP05	3.1.2(19)		1/21/91
	9	Main Steam Line Break Outside Containment	MS02	3.1.2(20)		1/30/91
	10	Main Feedwater Line Break Inside Containment	FW23	3.1.2(20)		2/21/91
	11	Dropped Rod	RD07	3.1.2(12)		1/30/91
4	1	Loss of 125 VDC Vital Bus	ED12	3.1.2(3)		1/28/91
	2	PR Channel Output Signal Failure	NI07	3.1.2(21)		1/31/91
	3	#1 Feedwater Heater Level Control Fails Lo	HD12	3.1.2(22)		2/4/91
	4	Loss of Vacuum	CN09	3.1.2(5)		2/20/91
	5	Charging Flow Control Problem, Pzr lvl Swing	CV15	3.1.2(22)		2/4/91
	6	Auto SI Initiation Signal Failure	RP02	3.1.2(23)		1/30/91
	7	Loss of Essential Control Air	IA03	3.1.2(2)		1/17/91
	8	Rods Fail to Move on Demand	RD08	3.1.2(13)		1/31/91
	9	Fuel Cladding Failure	TH09	3.1.2(14)		2/5/91
	10	Main Feedwater Line Break Outside Containment	FW20	3.1.2(20)		1/30/91
	11	IR Channel Failure	NI04	3.1.2(21)		2/6/91
	12	Charging Pumps Trip	CV01	3.1.2(18)		1/17/91
	13	Letdown Relief Valve Fails 62-662	CV16	3.1.2(22)		2/5/91

NT-P-7.3.1-8

APPENDIX D

Form 2

TENNESSEE VALLEY AUTHORITY

CERTIFICATION TEST ABSTRACT

Simulator Name: Sequoyah

Test Name: Malfunction Testing

Procedure Title: Certifying Simulators - Instructor Interface Evaluation Test

Procedure Number: NT-P-7.3.1-8, Attachment 6

Scheduled Frequency: Four-Year Periodic (Four Annual Tests)

Prepared By: Steve M. Michal Date: 3/6/91

Reviewed By: V Ed Keyser Date: 3/6/91

Approved By: J. Fletcher Date: 3/6/91

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-30-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: CV09 - Volume control tank level transmitter fails high (130A).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions effect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-30-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

CV09 VCT LEVEL TRANSMITTER FAILS HI(130-A)

TYPE: RB DISCRETE

CAUSE: Transmitter failure, 130-A (fails Hi)

PLANT STATUS: IC-10

EFFECTS: VCT level transmitter failure; (130A Fails Hi)

This malf affects only the signals generated from the VCT level transmitter; 130A.
Level transmitter 130A signals the listed functions;

VCT Hi-level divert (analog)
VCT Hi-level makeup cut-off
VCT Lo-level makeup initiate
RWST lo-level valve transfer

Failing the channel (high) will produce the listed effects;

1. LCV-62-118 diverts letdown from VCT. VCT level will decrease.
2. VCT makeup process will terminate if makeup was in progress at time malfunction was activated.
3. Auto makeup to VCT is defeated.
4. RWST low level transfer is defeated.

VCT level decreases at a rate equivalent to net charging. Manual operation of divert valve and makeup are unaffected and remains available. Charging pumps will lose suction if no Operator actions are taken.

Malf removal restores the transmitter to normal.

The following ANN's are associated with this malf:

6C-3 "VCT Level Hi-Low"

References:
47W611-62
47W610-62
Annunciator Response

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-15-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: TM05 - Steam generator tube failure (steam generator tube ruptures at top of tube bundle). Failures available for all four steam generators.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. All four steam generators tested at 1% and 100% leak size.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-15-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #131, #134, #137, and #138 were written. These deficiencies all involved minor radiation response adjustments.

5.2 Corrective Action Plans/Dates: DR #138 is corrected and awaiting recheck. DR #137 is open and will be completed by 5/1/91. DR #131 and #134 are corrected and closed.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

TH05 STEAM GENERATOR TUBE FAILURE

TYPE: RV Generic Variable: 100 % = 1000 gpm @ 1200 psid
A. S/G LOOP 1
B. S/G LOOP 2
C. S/G LOOP 3
D. S/G LOOP 4

CAUSE: Tube Failure

PLANT STATUS: IC-10

EFFECTS: S/G Tube Rupture At Top of Tube Bundle

A. S/G # 1 tube fails at input severity causing a loss of primary system coolant to the S/G secondary side coolant in the affected S/G. Pressurizer level and pressure will decrease depending on the severity level. Charging flow will increase to maintain Pzr level and VCT level will drop resulting in increase VCT makeup rate. At higher severity, two charging pumps will be required to maintain level. If leak rate exceeds charging pumps capacity, the RCS pressure and Pzr level will decrease to the point that the reactor will trip on low pressure or OTΔT. Following the Rx trip an SI more than likely will occur do to low RCS pressure. The radioactivity on the secondary side, and can be detected by S/G blowdown RAD monitors or condenser vacuum exhaust RAD monitors. At higher severity, a mismatch between steam flow and feedwater flow can be observed on affected S/G.

If the Rx is tripped and affected S/G is isolated, the level in this S/G will continue to rise until the RCS pressure is matched with the ruptured S/G pressure.

Malf removal restores tube integrity.

The following ANN's are associated with this malf:
12A-15 "CNDS VAC PMP AIR EXH MON HIGH RAD"
12A-24 "CNDS VAC PMP HI RNG AIR MON HI RAD"
12A-26 "STM GEN BLDN LIQ MON HIGH RAD"

B(C,D). S/G Loop 2(3,4) tube fails at input severity w/ similar results as malfunction TH05A.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-17-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: CV04 - Letdown line break in Auxiliary Building caused by pipe failure upstream of PCV-62-81, downstream of FE-62-82. Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-17-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect Document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written:

DR #150 - to change annunciator legends.

DR #152 - high radiation in the Auxiliary Building not as expected.

5.2 Corrective Action Plans/Dates: DR #152 is complete and closed. DR #150 involves installing new annunciator window and will be complete by 6/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

CV04 LETDOWN LINE BREAK, IN AUX BUILDING

TYPE: RV DISCRETE VARIABLE: 100% = 200 gpm @ 350 PSID

CAUSE: Pipe failure upstream of PCV-62-81, downstream of FE-62-82

PLANT STATUS: IC-10

EFFECTS: Letdown line break (aux bldg)

The effective severity is limited by the number of letdown orifices in service. At low severity (<25% of in service letdown flow), indicated letdown flow shows no change. The VCT level trace indicates an INC RCS leak rate.

Indications increase as severity increases;

a. Indicated letdown flow will slightly exceed the selected in service letdown orifice value.
b. VCT makeup frequency increases.
c. VCT level trace indicates the effective leak rate.
d. Aux bldg Rad monitors show increase in airborne contamination.
e. L/D press control PCV modulates to maintain set point.The PCV closes when selected malf severity exceeds the in service letdown orifice capability.

The malf can be isolated by closing the letdown orifices valves.

Malf removal repairs the letdown line.

The following ANN's and log PTS are associated w/ this malf:

6C-11 LOW PRESS LTDN FLOW HIGH PRESSURE HIGH
6C-03 VCT LEVEL HI-LOW (after period of time)

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-16-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: TH03 - Loss of coolant accident - small leak at steam generator outlet. Breaks available at all four steam generators. Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. All four loops were tested.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause and Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written:

#145 - Area radiation monitors

#146 - Containment particulate radiation monitors

#147 - Containment pocket sump level

Minor adjustments were necessary to obtain correct radiation levels for DR #145 and #146.

5.2 Corrective Action Plans/Dates: DR #145 and #146 will be adjusted by modifying detector efficiencies to satisfy expected responses (by 5/1/91). DR #147 is completed.

5.3 Exceptions Taken: None.

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

TH03 LOCA - SMALL LEAK

TYPE: RV GENERIC VARIABLE:

1.5	% =	1.8 gpm
50	% =	60.0 gpm
100%	% =	120.0 gpm

A. LOOP 1
B. LOOP 2
C. LOOP 3
D. LOOP 4

CAUSE: LEAKAGE AT S/G OUTLET

PLANT STATUS: IC-10

EFFECTS: Small Break LOCA

A) Loop 1 S/G outlet breaks at input severity; PZR level and press decrease. As malf severity increases, Pzr level decrease causes charging pump to increase charging flow. Plant stabilizes w/ standby charging pump running and cntmt sump lvl (pocket sump), humidity, press and activity increasing.Ice condenser doors will open & alarm. With one charging pump in service and no letdown, the maximum charging is approximately 120 gpm. With both charging pumps in service, adequate makeup is available, however manual makeup to VCT or transfer to RWST for charging pump suction is required. Containment pressure will increase. May receive an SI on high containment pressure.

Malf removal will restore piping integrity.

B(C,D) Loop 2(3,4) S/G outlet breaks at input severity w/ similar results as malf TH03A.

The following ANN's are associated with this malf:
5A-19 "REACTOR BLDG AUX FL & EQ DRAIN SUMP HI"
5A-25 "PRESSURIZER PRESSURE LOW BACKUP HTRS ON"
5C-10 "LOWER COMPT MOISTURE HI (Possible)

References"
Annunciator Response
AOI-6

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-17-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: TH04 - Pressurizer safety valve failure (mechanical failure, leaks through to pressurizer relief tank).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. TH04 a, b, and c were tested at 100% severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-17-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #139, #140, #141, #142, and #143 were written. DR #139, #140, and #141 involve adjustments to the pressurizer safety valve tailpipe temperatures and the accoustic monitor to provide different temperature response and more indicator lights on the accoustic monitor. DR #142 requires an adjustment to the reactor coolant pump seal injection outlet temperature response. This problem is not directly related to this malfunction, but was noted during this test and can be adjusted.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-17-91

5.2 Corrective Action Plans/Dates: DR #139, #140, and #141 are tuning adjustments to the temperature response of the pressurizer safety valves and will be complete by 5/1/91. DR #142 is an energy transfer adjustment for the reactor coolant pump bearing and will be complete by 6/1/91. DR #143 was a containment pressure response problem that is completed and tested.

5.3 Exceptions Taken: None.

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

TH04 PZR SAFETY FAILURE

TYPE: RV GENERIC VARIABLE: 100% = (1 SFTY VLV CAP) @ 2200 PSID
A. SV-68-563
B. SV-68-564
C. SV-68-565

CAUSE: Mechanical failure, vlv leaks into P.R.T.

PLANT STATUS: IC-10

EFFECTS: Failed PZR Safety Valve Leaks Through

A) PZR safety SV-68-563 leaks at a rate depending on input severity. PZR lvl and PZR level will decrease until an insurge of fluid from the hot leg takes place. PRT level, press and temp inc. The PRT rupture disk will rupture at approximately 80 psig. Once this happens, containment pressure, humidity, radiation, and temperature increases. Acoustic Monitors alarm at higher severities.

Malf removal will allow safety vlv to operate normal.

B) PZR safety SV-68-564 fails open (leaks). Leak rate determined by input severity w/ similar results as malf TH04A.

C) PZR safety SV-68-565 fails open (leaks). Leak rate determined by input severity w/ similar results as malf TH04A.

The following ANN's are associated with this malf:

12A-3 "CNTMT BLDG LWR COMPT AIR MON HI RAD"
5A-23 "PZR SAFETY VALVE LINES TEMP HIGH"
5A-30 (possible) "PZR POWER RELIEF LINE TEMP HI"
6B-20 "ICE CONDENSER LOWER INLET DOOR OPEN (after rupture disk gone)
5A-15 "PRT TEMP HIGH"
5A-22 "PRT PRESS HIGH"

References:
AOI-6
Annunciator Response

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-28-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: IA02 - Loss of non-essential control air caused by dryer routing valve failure.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. IA02 was tested at 25%, 32%, and 100% severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-28-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written:
DR #190 - MSIV closure on loss of air supply.
DR #191 - set points for isolation of control air to auxiliary air.
DR #192 - set point for service air isolation from control air.

5.2 Corrective Action Plans/Dates: DR #190, #191, and #192 are all corrected and ready for retest. They will be closed by 5/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

IA02 LOSS OF NON-ESSENTIAL CONTROL AIR

TYPE: RV DISCRETE VARIABLE: 100% = TOTAL LOSS
(100% = 4 COMPRESSORS)

CAUSE: Dryer routing valve failure

PLANT STATUS: IC-10

EFFECTS: Loss of non-essential control air

Dryer routing valve fails at input severity; air system pressure decreases. Air compressors start/load on decreasing header pressure. At 88 psig, service air isolates from control air (valve PCV-32-4 closes). As severity increases, additional compressors will start until all 4 are running w/ air press still decreasing. The auxiliary air compressors start at 75.5 psig and all non-essential loads are isolated at 68 psig by the closure of FCV-32-82 & FCV-32-85. At higher severities, the air pressure will decrease enough that the main feedwater regulating valves start closing, and MSIV's start closing, thus causing a Rx trip.

Malfunction removal restores air system to a functional condition.

The following ANN's are associated w/ this malf:

15B-28 service air isolation closed

References:

AOI-10 Section A

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-25-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: ED01 - Total loss of offsite power (close in three phase fault on 161 kV and 500 kV switchboards; main transformer bank 1 bus differential; main turbine trip). Power is unavailable from either switchyard of any CSSTs or USSTs.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-25-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Test continued until the conditions stated in the Malfunction Cause Effect document had been observed and pertinent plant parameters stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written: DR #177 - TB booster pumps; DR #180 - RM-90-106B, RM-90-112; DR #181 - Start bus volt meters; DR #182 - 480 volt meters; and DR #183 - ERCW pumps. All DRs involved minor logic changes to tie valves to proper power supplies.

5.2 Corrective Action Plans/Dates: All DRs listed have been corrected and are awaiting recheck. Recheck and closure of DRs will be prior to 5/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

ED01 TOTAL LOSS OF OFFSITE POWER

TYPE: RB DISCRETE

CAUSE: Close in three-phase fault on 161 KV and 500 switchboards; main transformer bank 1 bus differential; main turbine trip

PLANT STATUS: IC-10

EFFECTS: Total loss of offsite power.

Both switchboards are faulted, losing CSSTS. The main generator trips, which results in losing the USSTS.

This malf results in the loss of all offsite power. Power is unavailable from either switchyard, or any of the CSST's or USST's while the malfunction remains active.

Power is lost to all unit and shutdown boards. A reactor-turbine trip is initiated, all diesel generators auto start and energize their respective 6.9 KV shutdown boards, and the blackout sequence is initiated.

The loss of all RCP's initiates RCS natural circulation. Station pwr and support systems are available using the diesel generators (AOI-35 loss of offsite power).

Malf removal allows offsite pwr restoration from any 161 KV line source.

The following ANN's are associated with this malf:

1B-8(9,10,11) "6900V UNIT BD A (B,C,D) FAILURE OR UNDERVOLTAGE"
1B-22 (23) "480V UNIT BD A (B) FAILURE UV OR TRANSFER"
1B-12 (13) "6900 SD BD A-A (B-B) FAILURE OR BUS/NORMAL FEEDER UNDERVOLTAGE OR OVERVOLTAGE"
1B-26 (27,33,34) "480V SD BD A1-A (A2-A,B1-B,B2-B) FAILURE OR UNDERVOLTAGE"

References: 15E500-1; 45N763-1,2; 45N765-series; AOI-35

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-24-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: ED06 - Loss of 6.9 kV shutdown board (board fault picks up board differential lockout relay).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-24-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written:
DR #170 - ERCW valves (2) switched on power supply train ('A' train valve fed from 'B' train; 'B' train valve fed from 'A' train.)
DR #172 - moisture separator reheater and heater drain tank valves (normal) must have closed on loss of power -- bypass to condenser was open.

5.2 Corrective Action Plans/Dates: Both DRs have been corrected and will be rechecked and closed by 5/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS
ED06	LOSS OF 6.9 KV SHUTDOWN BOARD

TYPE: RV GENERIC
A. 6.9KV SHUTDOWN BOARD 1A-A
B. 6.9KV SHUTDOWN BOARD 1B-B

CAUSE: Board Fault Picks Up Board Differential Lockout Relay

PLANT STATUS: IC-10

EFFECTS:

A) Board fault picks up board differential lockout relay 86-S1A on 6.9kv shutdown Bd 1A-A. the board deenergizes, all source breakers are tripped and locked out. Shutdown Bd 1A-A is normally supplied from unit Bd 1B (Bkr 1716). The board fault will not prevent an auto diesel start, but as long as the fault remains the lockout relay will keep the D/G breaker (Bkr 1912) from closing. SD Bd 1A-A will remain de-energized. When the D/G starts, the ERCW valve to the D/G heat exchanger will remain closed as long as the 480V diesel aux Bd stays de-energized, leading to a D/G overheating problem but will not trip due to emergency start.

All connected 6.9KV/480V class 1E loads on train A will be deenergized.

B) Board fault picks up board differential lockout relay 86-S1B on 6.9 KV shutdown Bd 1B-B. Effects similar to A except train B.

Malf removal restores the bus integrity, and allows reset of the 86 Lockout relay with remote function EDR10 which in turn allows reclosure of the source breakers and board energized.

NOTE: Remote function EDR11 closes the breakers from 6900V SD Bd to the 480V SD Bd's.

The following ANN's are associated with this malf:
1B-12 (13) "6900 SD BD A-A (B-B) FAILURE OR BUS/NORMAL FEEDER UNDERVOLTAGE OR OVERVOLTAGE"

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

M..LF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

ED06 (CONT)

1B-26 (27,33,34) "480V SD BD A1-A (A2-A,B1-B,B2-B) FAILURE OR UNDERVOLTAGE"
26A-5 "DIESEL GEN 1A-A RUNNING"
26A-18 "D/G 1A-A JACKET WATER TEMP HIGH-LOW ENGINE 1 OR 2"
26B-5 "DIESEL GEN 1B-B RUNNING"
26B-18 "D/G 1B-B JACKET WATER TEMP HIGH-LOW ENGINE 1 OR 2"

References:
Annunciator Response
AOI-35

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-24-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: EDO8 - Loss of 480v shutdown board (board fault picks up 51 overcurrent lockout relay).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-24-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written:

DR #170 - ERCW power supplies have wrong train power supply (2 valves)

DR #174 - power supply to 2 ERCW valves and auxiliary ERCW screen wash pumps lost power (powered from U-2).

DR #178 - CCS TB booster pump in p-auto did not start when 1B lost power.

5.2 Corrective Action Plans/Dates: All three DRs have been corrected and are awaiting recheck. The minor software changes will be tested and DRs closed by 5/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

ED08 LOSS OF 480V SHUTDOWN BOARD

TYPE: RB GENERIC
A. 480V SHUTDOWN BOARD 1A1-A
B. 480V SHUTDOWN BOARD 1A2-A
C. 480V SHUTDOWN BOARD 1B1-B
D. 480V SHUTDOWN BOARD 1B2-B

CAUSE: Board Fault Picks Up 51 Overcurrent Lockout Relay

PLANT STATUS: IC-10

EFFECTS: A) 480V SD board 1A1-A normal feeder breaker trips from an overcurrent relay as a result of the board fault. 480V SD BD 1A1-A is normally supplied from 6.9KV SD BD 1A-A. The 480V SD boards do not have auto transfer capability.

Some major components affected by the loss of 480V SD BD 1A1-A are:

125 VDC vital battery charger I
120 VAC vital invertor 1-I (Lose 480V supply)
120 VAC Inst power Dist panel 1A
Diesel Aux BD 1A1-A
Control and Aux Bldg. Vent BD 1A1-A
Reactor MOV BD 1A1-A
Reactor Vent BD 1A-A

All connected 480v class 1E motor loads will be deenergized.

The following ANN's are associated with this malf:

1B-26 "480V SD BD 1A1-A FAILURE OR UNDERVOLTAGE"
1C-4 "125V DC VITAL CHGR I FAILURE OR VITAL BAT I DISCHARGE"
1C-6 "120V AC VITAL INVERTER 1-I ABNORMAL"
3A-6 "REACTOR MOV OR VENT BDS TRAIN A UNDERVOLTAGE"
3A-13 "DIESEL AUX BD 1A1-A OR 1A2-A UNDERVOLTAGE"
3A-20 "C & A BLDG VENT BD 1A1-A OR 1A2-A UNDERVOLTAGE"

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

ED08 (CONT)

B) Similar to A) except:
Major components affected by the loss of 480V SD BD 1A2-A are:

Diesel Aux BD 1A2-A
Control and Aux Bldg. Vent BD 1A2-A
Reactor MOV BD 1A2-A
Standby lighting cabinet no. 4

C) Similar to A) except:
Major components affected by the loss of 480V SD BD 1B1-B are:

ED08 (cont)

Diesel Aux BD 1B1-B
Control and Aux Bldg.Vent BD 1B1-B
Reactor MOV BD 1B1-B
Reactor Vent BD 1B-B
Standby lighting cabinet No. 2

D) Similar to A) except:
Major components affected by the loss of 480V SD BD 1B2-B are:

125VDC Vital Batt Charger II
120VAC Vital Invertor 1-II
120VAC Inst Power Dist Panel B
Diesel Aux BD 1B2-B
Control and Aux Bldg. Vent Bd 1B2-B
Reactor MOV BD 1B2-B

Malf removal restores board integrity. The overcurrent lockout relay is reset, and the 480V supply breaker reclosed, using remote function EDR11.

References: Annunciator Response
45N749-series

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: ED15 - Loss of 250v DC battery board due to board fault.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. ED15 was tested for a, b, c, and d.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #211 and #212 were written to resolve minor problems with power supply feeds.

5.2 Corrective Action Plans/Dates: DR #211 and #212 will be completed by 5/1/91. Each DR will involve minor logic changes to the power supply circuits and time delay circuits.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

ED15 LOSS OF 250 V DC BATTERY BOARD

TYPE: RB GENERIC
A. 250 VDC BATTERY BD 1
B. 250 VDC BATTERY BD 2
C. 250 VDC TURB DISTRIBUTION BOARD 1
D. 250 VDC TURB DISTRIBUTION BOARD 2

CAUSE: Battery Board fault

PLANT STATUS: IC-10

EFFECTS:

A) 250 V DC battery board I deenergizes. Power cannot be restored while malf remains active. 250 V DC power is lost to the following bds:

480 V AC Unit boards 1A & 1B
480 V AC water supply board
480 V AC service bldg main board
250 V DC electrical control dist board

250 VDC turb bldg dist bd 1 automatically transfers to 250 V DC battery bd 2.

See 45N704-1 for a list of affected components.

The following ANN's are associated with this malf:
1C-32 "250V DC Bat CHGR 1 OR BAT BD 1 ABNORMAL"
1C-33 "250V DC TURB DIST BD 1 UV OR BKR TRIP"

B) Similar to A), except refer to 45N704-2. No unit 1 250 V DC board supplies are affected except 250 V DC turb bldg distribution bd 2 which auto transfers to 250VDC battery bd 1. If Unit 1 is greater than 5 % turbine load when the power is restored to this battery board, the 52 Z relay when reenergized will send a signal to the EHC control system, and the unit load will automatically think the unit has just tied on the line, and the turbine will go to 5 % load from present load. This could cause a unit trip due to a large load swing.

MALF. NO.	MALFUNCTION TITLE / RANGE
	[illegible]

C) 250V turbine distribution board 1 deenerigizes. DC control power to the 480V turbine bldg common board and to RCP's 2 & 4 breakers are lost. Other control buses auto transfer after a split second loss of pwr. Annunciators will pick up on that momentary loss for 6.9KV start bus 1A, common bd A, and unit bds 1A and 1C.

The control pwr transfer of 6.9KV unit bds 1A & 1C should be identified as placing the unit in a LCO per T.S. 3.8.3.1 The RCP and unit board breakers will not be on a single control pwr source which does not meet operability criteria for containment penetration integrity. The # 3 and # 7 HDT pumps trip.

See 45N705 for a list of affected components.

The following ANN's are associated with this malf:
1C-33 "250V DC TURB DIST BD 1 UV OR BKR TRIP"

D) Similar to C) except no effect on 480 V turbine bldg common bd. RCP's 1 & 3 breakers' control power and 6.9 KV start bus 1B control power, which are manual transfer to alternate, are lost. Auto transfer of control power occurs, and is annunciated, on 6.9 KV common bd B and unit bds 1B and 1D.

Malf removal restores pwr to the 250VDC battery bd, and restores the battery charger to service.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-17-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RC01 - Reactor coolant pump locked rotor (bad pump bearing/shaft breaks).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #253 was written to report a safety injection actuation due to low steam generator pressure.

5.2 Corrective Action Plans/Dates: DR #253 will determine correct pressure response of the steam generator during reactor coolant flow coastdown. It appears that a steam generator heat transfer adjustment has already corrected this problem. DR #253 will close by 5/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RC01 RCP LOCKED ROTOR

TYPE: RB GENERIC
A. RCP #1
B. RCP #2
C. RCP #3
D. RCP #4

CAUSE: Locked Rotor (Bad pump bearing - shaft breaks)

PLANT STATUS: IC-10

EFFECTS: RCP locked rotor

A) #1 RCP rotor l[illegible] the RCP shaft breaks and the pump immediately stop[illegible]ut the RCP motor continues to run. Flow through the RC loop will quickly decreases to zero, and reverses. A reactor trip signal is initiated if reactor power is above P8 (35%).

When reactor power is below P8, the loss of flow without coincident reactor trip initiates a pressure and temperature transient. At higher power levels but below P-8, the S/G level rapidly decrease and produce a level swing which may cause a reactor trip on low-low level or a high-high level turbine and FW pump trip.

Malf removal allows the RCP to rotate freely.

B - D) Generics are similar to RCP # 1.

The following ANN's are associated with this malf:
6A-4(11,18,25) "REACTOR COOLANT LOOP 1(2,3,4) LOW FLOW"
4D-28 "ONE LOOP LOW FLOW REACTOR TRIP"

References:
Annunciator Response
47W611-99 series
AOI-5

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-31-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RD05 - RCCA misalignment due to life coil failure for 16 different rods.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. RD05 was tested for all 16 rods.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-31-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #207 was written because some rods did not respond to the malfunction.

5.2 Corrective Action Plans/Dates: DR #207 will correct coding to allow rods K-14 and P-6 to also become misaligned. This DR will be complete by 7/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RD05 RCCA MISALIGNMENT

TYPE: RB GENERIC (TWO RODS/BANK)

A.	CBA, F-8	I.	SDA, M-14
B.	CBA, K-8	J.	SDA, B-4
C.	CBB, F-14	K.	SDB, C-9
D.	CBB, F-2	L.	SDB, N-9
E.	CBC, H-14	M.	SDC, N-5
F.	CBC, K-6	N.	SDC, C-11
G.	CBD, H-8	O.	SDD, L-3
H.	CBD, D-12	P.	SDD, N-11

CAUSE: LIFT COIL FAILURE

PLANT STATUS: IC-10

EFFECTS: RCCA misalignment, single rod.

A) Control Bank-A, group-2, RCCA F8 lift coil fails. (no indication) RCCA F8 does not respond to any auto, manual, or bank select signal. F8 will trip into the core on reactor trip signal.

An RCCA misalignment is indicated when bank movement is sufficient to see no RPI movement and/or rod misalignment alarm @ ± 13 steps out.

Malf removal restores the RCCA F8 lift coil to normal. Rod movement from present position is available.

Generics are similar.

Possible Alarms are:
4B-25 "Computer Alarm Rod Dev and Seq NIS Pwr Range Tilts"

Indications are:
Deviation between RPI and step counter
Deviation between RPI and other rods RPI's

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-25-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RW02 - Raw cooling water pump trip due to faulty Amtector relay.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-25-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RW02 RAW COOLING WATER PUMP TRIP

TYPE: RB GENERIC
A) RCW PUMP A
B) RCW PUMP B
C) RCW PUMP C
D) RCW PUMP D
E) RCW PUMP E

CAUSE: Faulty Amtector Relay

PLANT STATUS: IC-10

EFFECTS: Loss of single RCW PUMP

A) RCW pump A trips; white light and alarm indicate pump trip status. System pressure decreases. Standby starts at 35 Psig, returning system conditions to normal.

While malfunction is active, the pump will not start.

(NOTE: Buzzer w/ this malf and can be stopped and white light extinguished by taking pump control switch to stop)

Malf removal will allow RCW pump A to operate normal.

B(C,D,E) RCW PUMP B(C, D, E) trips w/ similar results as malf RW02A.

The following ANN's are associated with this malf:

15A-14 "MOTOR TRIPOUT"

References:
Annunciator Response
SOI-24
45N777-2
47B601-24-2,3

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-5-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RW07 - Loss of cooling to main feed pump oil coolers caused by heat exchanger fouling.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-5-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached)

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #222 was written for the main feed pump vibration indications.

5.2 Corrective Action Plans/Dates: DR #222 will be worked by wiring the vibration hardware and will be complete prior to 8/1/91.

5.3 Exceptions Taken: None.

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RW07 LOSS OF COOLING TO MAIN FEED PUMP OIL COOLERS

TYPE: RB Generic
A. Pump A
B. Pump B

CAUSE: Htx Fouling

PLANT STATUS: IC-10

EFFECTS: Loss of Cooling to MFP Lube Oil

A. Main Feed water pump turbine (MFWPT) lube oil cooler plugs (fouls) causing FWPT A bearing temperatures to increase. At 180 ^{0} F (brg temp) FWPT vibration increases.
Note: There is no automatic high vibration trip on the main feed water turbines however high vibration may jar other instruments that could trip the turbine.
Instructor can trip the main feed water pump with malf. FW05 or can simulate placing standby Htx in service by removing this malfunction.

Malfunction removal restores affected Htx to normal.

B. MFWPT B lube oil cooler plugs w/ similar results as malfunction RW07A.

The following ANN's are associated with this malf:
3B-1(8) "MFP TURBINE 1A(1B) ABNORMAL"
3B-19 "THRUST BRG DRN OIL TEMP HI"
3B-20 "# 1 BRG DRN OIL TEMP HI"
3B-21 "# 2 BRG DRN OIL TEMP HI"
3B-23 "OIL COOLER DISCH TEMP HI"
3B-25 "TURBINE VIBE EXCESSIVE"
3B-26 "PUMP VIBE EXCESSIVE"

Reference:
Annunciator Response
47W610-46
45N646-1,2

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-21-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RH04 - Residual heat removal loop suction line blockage caused by debris fouling line.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. RH04 tested at 1% through 100% severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RH04 RHR LOOP SUCTION LINE BLOCKAGE

TYPE: RV GENERIC VARIABLE: 100% = TOTAL BLOCKAGE
A. LOOP A
B. LOOP B

CAUSE: DEBRIS FOULING

PLANT STATUS: IC-2

EFFECTS: Loss of RHR cooling flow

A) RHR loop A suction line blocks at input severity; system flow decreases, RHR system and RCS temperatures increase. PZR level and press increase as severity increases, system flow continues to dec w/ corresponding increase in temperatures. RHR pumps mini flow vlvs open. At maximum severity, system flow is stopped completely (resulting in continually increasing RCS temps). System degradation may be alleviated by the starting of the opposite loop RHR pump. If RHR pump A remains running, it will trip on overcurrent in approximately 10 mihs w/ white light and alarm indicating pump seizure.

Malf removal returns affected pipe to normal.

B) RHR loop B suction line blocks at input severity w/ similar results as malf RH04A.

The following ANN's are associated with this malf:

6D-4 "RHR PUMPS DISCH PRESS HI OR MINIFLOW CONDITION"
1B-31 "MOTOR TRIPOUT PNL 1-M-1 THRU 1-M-6"

References"
Annunciator Response
AOI-14
47W611-74

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-31-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RP01 - Reactor trip signal failure (ATWS)/breakers fail to open.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: Tested for a, b, and c; c was correct. DR #206 was written for a and b, not giving correct feedwater isolation signal.

5.2 Corrective Action Plans/Dates: DR #206 will be worked by 6/1/91. Software will model reactor trip breaker logic in feedwater isolation signal.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RP01 REACTOR TRIP SIGNAL FAILURE (ATWS)

TYPE: RB GENERIC
- A. RTA FAILS
- B. RTB FAILS
- C. BOTH Rx TRIP BKR'S FAIL

CAUSE: Trip Breakers Trip Bar Fails

PLANT STATUS: IC-10

EFFECTS: Breakers fail to open.

A. When the reactor protection system (RPS) receives a trip signal, the reactor trip breaker A (RTA) will not open. The turbine will trip due to RTB opening. Any functions that receive a initiation signal from P-4 auxiliary contacts of the reactor trip breaker A will not work properly (FW Isolation A Train). The reactor first out ANN will function properly.

B. When the reactor protection system (RPS) receives a trip signal, the reactor trip breaker B (RTB) will not open. The turbine will trip due to RTA opening. Any functions that receive a initiation signal from P-4 auxiliary contacts of the reactor trip breaker B will not work properly (FW Isolation B Train). The reactor first out ANN will function properly.

C. When the reactor protection system (RPS) receives a trip signal, both reactor trip breakers will not open. The turbine will NOT trip from any reactor trip signal but will trip from a Hi-Hi S/G level or SI signal. Any functions that receive a initiation signal from P-4 auxiliary contacts of the reactor trip breakers will not work properly. The reactor first out ANN will function properly.

Malfunction removal allows breakers to trip.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-5-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: CC04 - Component cooling pipe break inside containment (pipe break on reactor coolant pump oil cooler supply header, 600 gpm at normal operating pressure).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-5-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written: DR #220 - All reactor coolant pump oil level alarms come in at the same time. DR #221 - alarm window #31 (XA-55-5B).

5.2 Corrective Action Plans/Dates: DR #220 is completed and awaiting retest. DR #221 is complete and tested.

5.3 Exceptions Taken: None.

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS
CC04	COMP COOL PIPE BREAK INSIDE CNTMT
TYPE:	RB DISCRETE
CAUSE:	Pipe break on RCP oil cooler supply header 600 gpm at normal operating pressure
PLANT STATUS:	IC 10
EFFECTS:	Loss of coooling to RCP oil clrs
	RCP oil cooler supply HDR line breaks inside containment (CNTMT). Component cooling flow to RCP oil cldr dec. Mass lost from CC system os recovered in rx bldg flr. & equip drain sump w/ inc in cooling will result in overheating of rcp bearings w/ an eventual resultant rcp shaft seizure and plant trip. Operaters should trip unit and take off the RCp's w/in 2 min- GOT-8
	Leak is isolable but cooling loss to RCP oil clrs will be similar to actual malfunction.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-25-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: CN02 - Condensate booster pump trip caused by faulty 50 relay (instantaneous overcurrent).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS
CN02	CONDENSATE BOOSTER PMP TRIP

TYPE: RB GENERIC
A. PUMP A
B. PUMP B
C. PUMP C

CAUSE: Faulty 50 relay

PLANT STATUS: IC-10

EFFECTS: Loss of single condensate booster pmp

A) Condensate booster pmp a trips; white light and alarm indicate pmp status. Pmp amps, pmp temps and system press dec. system press stabilizes as supplied buy both remaining pmps. Any attempt to restart pmp while malf is active, results in failure of breaker to close and results in white light buzzer on again. The fw pump suction press will decrease and fw flow will decrease. The fw pumps will have to load up to bring fw press back to program. The FW system press & flow will swing and possibly a unit trip occur if unit is at high pwr. The suction vlv of tripped pmp will close.

Malf removal allows the pmp to operate as necessary.

B) Cond booster pmp B trips w/ similar results as malf FW02A.

C) Cond booster pmp C trips w/ similar results as malf FW02A.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: MS01 - Main steam line break inside containment caused by pipe failure, upstream of flow element.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. MS01 was tested at varying severities for all four loops.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written:
DR #214 reported vibration and loose parts.
DR #215 indicated reactor power did not increase when steam flow increased.

5.2 Corrective Action Plans/Dates: DR #214 is completed and closed. DR #215 is being worked and is a nuclear instrumentation problem requiring minor tuning. DR #215 will be completed by 6/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS
MS01	MAIN STEAM LINE BREAK INSIDE CONTAINMENT
TYPE:	NRVI Generic variable: 100 % = 2 X 10^6 #/Hr @ 750 psid A. S/G # 1 B. S/G # 2 C. S/G # 3 D. S/G # 4
CAUSE:	Pipe Failure, Upstream of Flow Element
PLANT STATUS:	IC-10
EFFECTS:	Steam Line Break Inside Containment
A.	Main steam line from S/G # 1 breaks inside containment at input severity. Steam flow decreases on loop with break and increases on other loops. Steam pressure decreases on all loops but is more severe on faulted loop at a rate depending on leak size and will cool primary syspem due to increase steaming rate. The magnitude and duration of the RCS cooldown depend on initial power level and burnup. Only one S/G will feed the break. The decrease in Tave will add positive reactivity to the core. Pzr level and pressure will follow Tave. Containment pressure, temperature, radiation, and humidity increase as severity increases. At higher severity, safety injection, reactor trip, and MSIV isolation occur. Containment spray actuates if containment reaches 2.81 psig. S/G will continue to blowdown to containment until all the water mass in the S/G has depleted. The simulator must be reset to recover from malf.
B.	Main steam line from S/G # 2 breaks inside containment at input severity s/ similar results as malf MS01A.
C.	Main steam line from S/G # 3 breaks inside containment at input severity s/ similar results as malf MS01A.
D.	Main steam line from S/G # 4 breaks inside containment at input severity s/ similar results as malf MS01A.

The following ARN's are associated with this Malf:

5A-21 "STEAM LINE STOP VLVS CLOSED"
6P-30 "S/G LOOPS PRESS LO"
5C-8 "LOWER COMPT TEMP HI"

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

MS01 (Cont.)

6E-20 "ICE CNDSR LWR INLET DOOR OPEN"
5C-10 "LWR COMPT MOISTURE HI"
6B-2(9,16,23) "LOW STEAMLINE PRESSURE LOOP 1(2,3,4)"
4D-22 "REACTOR TRIP LOW STEAMLINE PRESSURE SAFETY INJ."

References:
47W801; 47W610-1; 47W611-1,63,99
Annunciator Response
E-1; E-2

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: FW05 - Trip of single main feedwater pump due to faulty oil pressure trip device.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. FW05 was tested for a and b.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #213 was written to improve Malfunction Cause & Effects explanation of the cause. (Instructor enhancement only.)

5.2 Corrective Action Plans/Dates: DR #213 will be closed by 2/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

FW05 MAIN FEED PUMP TRIP

TYPE: RB GENERIC
A. PUMP A
B. PUMP B

CAUSE: Faulty Oil Pressure Trip Device

PLANT STATUS: IC-10

EFFECTS: Trip of single Main Feedwater (FW) pump

A) When this malf is initiated, main FW pump A trips. If load is greater than 80 %, a main turbine runback is initiated utilizing the BOP runback (valve position limiter). The turbine runs back to approximately 75 % load. All auxiliary feedwater pmps start and feed the S/G's. Isolation of the A MFPT condenser occurs. B MFPT will accelerate to its high speed stop which is capable of delivering approximately 80% flow requirements. This acceleration along w/ the turbine runback to 75% load and the auxiliary feedwater pmps starting will restore flow to approximately 85% within 20 secs. and may prevent a reactor trip. How responsive the main FW pump controls, main FW regulating valves, steam dump controls, and rod controls are, will determine if a Rx trip occurs.

Feedwater flow to the S/G's will decrease causing the S/G levels to decrease. The S/G reg. valves will open and try to restore S/G levels, and the B FW pump speed will increase to restore steam/feedwater delta P.
Malfunction removal allows the A main FW pump to be restarted.
The following ANN's are associated with this malf:

3B-1 "MAIN FW PUMP TURBINE 1A ABNORMAL."
3B-2 "TRIPPED"
3C-1 "MFP 1A DISCHARGE FLOW LOW"
5A-14 "S/G LVL HIGH-LOW DEVIATION"
2A-8 "TURBINE RUNBACK BOP"
6B-1,8,15,22 "S/G LOOP __ LOW FW FLOW LOW WATER LEVEL"

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

B) Turbine driven feed pump B trips w/ similar results as malf FW05A.

References:
AOI-16
Annunciator Response
47W610-3
47W611-3

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: FW07 - Loss of single auxiliary feedwater pump (or failure of pump to start) due to faulty 50 relay/T&T valve failure. Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. FW07 was tested for a, b, and c.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

FW07 AFW PUMP TRIP OR FAIL TO START

TYPE: RB GENERIC
- A. PUMP A
- B. PUMP B
- C. PUMP C-S

CAUSE: Faulty 50 relay/ T&T valve failure

PLANT STATUS: IC-04

EFFECTS: Loss of single AFW pump

A) Electric AFW pump A trips: White light and alarm indicate pump status. Pump amps, discharge press and flow dec to S/G'S #1 & #2. Remaining S/G'S are supplied by remaining running AFW pumps. Any attempt to restart the pump, while the malfunction is active, results in an immediate disagreement light & alarm (pump will not restart) (note: Buzzer sounds w/ this malf and can be stopped and white light extinguished by taking pump switch to stop)

Malf removal allows the pump to operate as necessary.

B) Electric AFW pump B trips w/ similar results as malf FW07A.

C) Terry Turbine stops or fails to start do to a T & T valve failure w/ similar results as malf FW07A except flow is lost to all S/G's from the Terry Turbine.

The following ANN'S are associated with this malf.

FW07A & FW07B
1B-31 "MOTOR TRIPOUT PNL 1-M-1 THRU 1-M-6"

FW07C
NONE

References:
Annunciator Response
47W610-; 47W611-3; 45N765-6

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-21-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: TH01 - Loss of coolant accident - hot leg (pipe failure at reactor vessel nozzle). Failures available at all four hot legs. Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. TH01 was tested at 1% and 100% power levels.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-21-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

TF01 LOCA - HOT LEG

TYPE: NRVI GENERIC VARIABLE: 100% = COMPLETE SEVERANCE
A. LOOP 1
B. LOOP 2
C. LOOP 3
D. LOOP 4

CAUSE: Pipe failure at reactor vessel nozzle

PLANT STATUS: IC-10

EFFECTS: Hot Leg LOCA

A) loop 1 hot leg nozzle breaks at input severity; RCS rapidly depressurizes and flashes to containment. Containment radiation, temp, humidity, press and sump level inc. RX trips, safety injection actuates, hi containment press actuation isolates containment.

RCP'S cavitate, charging, SI pumps, RHR pumps and cold leg accumulators will reflood the core. Ice condenser doors will open to help cool and condense the steam. A portion of fluid injected to loop 1 will leak out the break. As severity inc, the magnitude and rate of affects inc. w/ cntmt isolation phase B and cntmt spray actuation on HI-HI cntmt press.

NOTE: Radiation rate of inc in cntmt is dependent upon the size of the break, and dependent upon core damage due to poor core cooling.

Simulator must be reset to recover from malf. (nonrecoverable malfunction)

B) Loop 2 hot leg nozzle breaks at input severity w/ similar results as malf TH01A.

C) Loop 3 hot leg nozzle breaks at input severity w/ similar results as malf TH01A.

D) Loop 4 hot leg nozzle breaks at input severity w/ similar results as malf TH01A.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-31-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: TU02 - Main turbine high vibration due to bearing failure.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.? 3.4, 4.3, 4.4, and Appendix A?.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. TU02 was tested for all 11 bearings.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-31-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initia condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #199 was written on the vibration recorder. Also, turbine first out was not correct.

5.2 Corrective Action Plans/Dates: DR #199 will be worked by 6/1/91 and will involve a minor hardware fix to the recorder and adjustments to the "Auto Stop Oil Turbine Trip" first out alarm logic.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

TU02 MAIN TURBINE HIGH VIBRATION

TYPE: RV GENERIC VARIABLE: 100% = 15 MILS

A. TURB BRG #1	F. TURB BRG #6
B. TURB BRG #2	G. TURB BRG #7
C. TURB BRG #3	H. TURB BRG #8
D. TURB BRG #4	I. TURB BRG #9
E. TURB BRG #5	J. TURB BRG #10
	K. EXCITER BRG #11

CAUSE: Bearing Failure

PLANT STATUS: IC-10

EFFECTS: Turbine response to high vibes

A) Turbine BRG #1 fails. Vibration increase to input severity; bearing temps increase on falling BRG. High vibration alarm comes in at approximately 7 mills. Turbine trips when input severity exceeds setpoint (14 mils). Hi vibration trip may be blocked w/ vibration cutout switch on PNL M-2. Ramp time of vibration increase is dependent on instructor input.

Malf removal restores BRG to proper operating condition.

B) #2 bearing vibration increases to input severity w/ similar results as malf TU02A.

-K) # 3 - # 11 bearing vibration increases to input severity w/ similar results as TU02A.

The following ANN's are associated with this malf:

2A-25 "TURBINE HIGH VIBRATION PRE-TRIP"
4C-8 "TURBINE HIGH VIBRATION TURBINE TRIP"

References:
Annunciator Response
47W647-2

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-29-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: EG01 - Main generator trip caused by electrical fault.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. EG01 was tested for a (reverse power), b (differential), and c (overcurrent).

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-29-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to , the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #196 was written to add additional logic to window #30, 1-XA-55-2A.

5.2 Corrective Action Plans/Dates: Minor logic change was made and DR #196 is ready to recheck. Closure will be made prior to 5/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

EG01 MAIN GENERATOR TRIP

TYPE: RB GENERIC
(ANNUNCIATOR IS SPECIFIC FOR TYPE OF TRIP)
A) REVERSE POWER (ANN 1A-8)
B) DIFFERENTIAL (ECR-1)
C) OVERCURRENT (ECR-2)

CAUSE: Electrical fault

PLANT STATUS: IC-10

EFFECTS: Main generator trip

The main generator trips. The listed annunciators are specific for the associated problem. The results are similar for each generic malfunction.

The generator trip initiates a turbine trip.
Generator MWE output goes to zero.
The normal turbine trip sequence is initiate;

EHC panel indicates all turbine valves closed.
Generator PCB's open.
6.9 KV BD's fast transfer to start buses.
Steam dump valves open to cool RCS to no-load Tave
RCS stabilizes at hot standby.

The generator cannot be reset while the malf remains active.

Malfunction removal restores the generator problem to normal condition.

The Ann's listed above are specific to this malfunction. Other ANN's will occur due to secondary effects of generator and reactor trip. Some of these are:

4C-15 "ELECTRICAL TROUBLE TURBINE TRIP"
4C-1 "AUTO STOP TURBINE TRIP"
6B-33 "TURBINE STEAMLINE STOP VALVES CLOSED"

References:
AOI-17
Annunciator Response

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-28-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: ED10 - Loss of 120v AC inverter due to internal inverter fault.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-28-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DRs #184 and #185 involve minor power supply changes to individual valves and controllers.

5.2 Corrective Action Plans/Dates: DR #184 and #185 require minor software corrections and both will be completed by 6/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

ED10 LOSS OF 120VAC INVERTER

TYPE: RB GENERIC
A. VITAL INVERTER 1-I
B. VITAL INVERTER 1-I
C. VITAL INVERTER 1-III
D. VITAL INVERTER 1-IV
E. PREFERRED INVERTER 1
F. PREFERRED INVERTER 2

CAUSE: Internal Inverter Fault

PLANT STATUS: IC-10

EFFECTS: A) 120VAC vital inverter 1-I fails. The inverter supplies power to the 120VAC vital BD 1-I.The inverter is normally fed from the 480V SD BD 1A1-A or from 125 VAC battery SD I. When the inverter fails, the power supply for 120 VAC vital BD 1-I fails.

The following annunciators are associated with this malf:

1C-06 "120 VAC Inverter 1-I Abnormal"
1C-07 "120 VAC Vital PWR BD 1-I UV or Bkr Trip"

The reactor trips due to Low-Low S/G level caused by Loop 1 S/G main feedwater level controller power lost and main FW Reg. valve closing. Refer to AOI-25.1 for other effects.

B) Similar to A) except:
The following annunciators are associated w/ this malf:

1C-13 "120 VAC Inverter 1-II abnormal"
1C-14 "120 VAC Vital Pwr BD 1-II UV or BRK Trip"

The reactor trips due to Low-Low S/G level caused by Loop 2 S/G main feedwater level controller power lost and main FW Reg. valve closing. Refer to AOI-25.2 for other effects.

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

C) Similar to A) except:
The following annunciators are associated with this malf:

1C-20 "Inverter 1-III Abnormal"
1C-21 "120VAC Vital PWR BD 1-III UV or BRK trip"

Reactor trips due to Low-Low S/G level caused by Loop 3 S/G main feedwater level controller power lost and main FW Reg. valve closing. Refer to AOI-25.3 for other effects.

D) Similar to A) except:
The following annunciators are associated with this malf:

1C-27 "Inverter 1-IV Abnormal"
1C-28 "120VAC Vital PWR BD 1-IV UV or BRK trip"

Reactor trips due to Low-Low S/G level caused by Loop 4 S/G main feedwater level controller power lost and main FW Reg. valve closing. Refer to AOI-25.4 for other effects.

E) 120VAC preferred inverter 1 fails. The inverter supplies power to the 120VAC preferred power board 1. The inverter is supplied from 480V aux bldg common BD A or from 250 VDC battery board 1. When the inverter fails, the power supply for 120VAC preferred power board 1 fails.
The following annunciator is associated with this malf:

1C-34 "PFD INVR 1 PWR BD 1 OR COMP INVR 1 ABNL OR TSC COMP INVR 1 FAILURE"

F) Similar to E) except:
No unit 1 annunciation directly associated with PFD Inverter 2 failure. Unit 2 receives ANN on PFD inverter 2 failure.

Malf removal restores the associated inverter to normal. For additional info. on the loss of the vital inverters see AOI-25.1 to 25.4.

References: AOI-25.1; 25.2; 25.3; 25.4
Annunciator Response

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-29-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RX18 - T-Avg control signal failure (auctioneer circuit fails).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. RX18 was tested at 1%, 50%, and 100% power levels.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of function, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-29-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attache).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RX18 T-AVG CONTROL SIGNAL FAILURE

TYPE: RV DISCRETE VARIABLE: 100% = 600 DEG F
1% = 500 DEG F

CAUSE: FAILURE OF THE AVERAGE T-AVG (CONTROLLING) SIGNAL.

PLANT STATUS: IC-10

EFFECTS: Failure of the T-AVG (controlling) signal.

The auctioneer circuit fails, passing a controlling T-AVG signal as selected by malf severity. The faulted T-AVG signal can not be changed from the control boards. The listed control systems receive the controlling T-AVG signal as input:

Steam Dump System
PZR Level Control
Rod Control
Rod Insertion Limit Computer (Not Used)
T-AVG / T-REF Recorder

The listed systems will respond to the failed T-AVG signal. Manual control of each system remains available.

If T-Ave signal fails high (600 Deg. F) steam dumps will open 100 % if steam dumps are armed. Pzr level program will go to 60 %, control rods will step in at 72 steps/min. If T-Ave signal fails low (500 Deg. F), steam dumps will not open even if armed while in T-Ave mode; control rods will step out until 220 steps, and Pzr level program will go to 24.7 %.

Malf restores the auctioneer circuit to normal.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-29-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RX07 - Pressurizer pressure transmitter fails high (transmitter failure). Four transmitters were tested. Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selec' to various degrees of severity. RX07 was tested for PT-68-. . fail high; PT-68-334 fail high; PT-68-323 fail high; and PT-68-322 fail high.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-29-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RX07 PZR PRESSURE TRANSMITTER FAILS HI

TYPE:
RB Generic
A. Channel I (68-340)
B. Channel II (68-334)
C. Channel III (68-323)
D. Channel IV (68-322)

CAUSE: Transmitter Failure

PLANT STATUS: IC-10

EFFECTS: Pzr Pressure Transmitter Failure

A. Channel I,PT-68-340 fails high. Indications from the failed channel are as listed:
Press indication increases to full scale
Press recorder increases (if selected)
Spray controllers initiate spray (PIC-68-340A/B)
The failed channel is an input for the reactor protection system. Channel I trips high pressure Rx trip bistable. Channel I of P-11 drops out,but P-11 still made. Control junctions that are affected by the failure are as follows (If channel I is controlling channel):
Pzr PORV Logic (1/2 logic made up)
Variable control Pzr heaters go off
Backup heaters go off
Pzr sprays come full open
Malfunction removal restores the pressure transmitter to normal.

B,C,D. Generics are similar except channels I and III are the only two channels that control the sprays and heaters. Channels III and IV are the interlocking channels for the Pzr PORV's.
The following ANN's are associated with this malf:
5A-10 "PZR PRESS ABOVE REF SET POINT"
6A-19 "PZR HI-PRESS"
6A-12 "PZR LO-PRESS (due to actual press drop)
6A-33 "PZR LO-PRESS SI" (actual press drop)
4D-26 "PZR LOW PRESS RX TRIP" (actual drop)
4D-36 "PZR SAFETY INJ PRESS LOW RX TRIP" (due to actual pressure drop)
Reference: Annunciator Response
AOI-18

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-25-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RH01 - Loss of single residual heat removal pump (or failure to start) due to faulty 50 relay (instantaneous overcurrent). Test results were documented on the Malfunction Testing forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component. Others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-25-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RH01 RHR PUMP TRIPS or FAILS TO START

TYPE: RB Generic
A. Pump A
B. Pump B

CAUSE: Faulty 50 (overcurrent) relay

PLANT STATUS: IC-10

EFFECTS: Loss of single RHR pump

A. RHR pump will trip is running or immediately trip if automatically started. Will receive a disagreement white light and tripout ANN which can be extinguished by placing control handswitch to stop position. Motor amps and pump flow (if pumping) will go to zero. Discharge pressure will decrease to suction pressure. Any attempt to start RHR pump A, while malf is active will again result in white light and tripout ANN. If RHR system was in cooldown mode, the RCS may heat up if A RHR pump was the only pump in service. Train B can be put in service for RCS cooldown.

Malfunction removal allows pump to operate normal.

The following ANN's are associated with this malf:

1B-31 "MOTOR TRIPOUT PNL 1-M-1 THRU 1-M-6"

B. RHR pump B will trip or fail to start w/ similar results as RH01A.

References:
Annunciator Response
45N765-13
47W610-74; 47W611-74

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-21-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RP05 - False auto reactor trip signal caused by multiple electrical failures. Failure A is a manual signal failure; failure B is an overtemperature delta-T failure; failure C is overpressure delta-T; failure D is two loop low-flow; and failure E is one loop low-flow.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. RP05 was tested for 5 out of 5 options.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-21-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficienties Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RP05 FALSE AUTO REACTOR TRIP SIGNAL

TYPE: RB GENERIC
A. (4D-01) MANUAL
B. (4D-11) OTΔT
C. (4D-16) OPΔT
D. (4D-23) TWO LOOP LOW-FLOW
E. (4D-28) ONE LOOP LOW-FLOW

CAUSE: Multiple Electrical failures

PLANT STATUS: IC-10

EFFECTS: Generate a false auto reactor trip signal.

A reactor trip signal is initiated. A normal reactor trip sequence causes the following:

RX trip breakers open
Turbine trips
Feedwater isolation initiates
Steam Dump activates

The first out alarm will annunciate, but the Rx trip alert alarms on XA-55-6A will not alarm. In addition, the trip status lights will not come in.

The trip signal is spurious. A reactor reset and restart can commerce following malfunction removal.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-30-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: MS02 - Main steam line break outside containment due to pipe failure, downstream of MSIV.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. MS02 was tested at 25%, 50%, 75% and 100% severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-30-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written:

DR #151 - steam flow greater than feed flow but steam generator level remains the same.

DR #168 - core delta-T and NIs mismatch.

DR #200 - auxiliary feedwater pumps trip after start.

DR #201 - after trip voltage swings on generator and USST.

5.2 Corrective Action Plans/Dates: DR #151, #168, and #200 have been corrected and are awaiting retest. DR #201 is being investigated. DR #201 will be completed by 5/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

MS02 MAIN STEAM LINE BREAK OUTSIDE CONTAINMENT

TYPE: NRVI Generic variable: 100 % = 3 X 10^6 @ 750 psid
- A. S/G # 1
- B. S/G # 2
- C. S/G # 3
- D. S/G # 4

CAUSE: Pipe Failure, Downstream of MSIV

PLANT STATUS: IC-10

EFFECTS: Main Steam Line Break Outside Containment

A. Main steam header downstream of 1 MSIV breaks at input severity. Steam flow increases from all S/G's. The S/G levels may swell initially due to the pressure decrease S/G pressure and main steam header pressure will decrease. The increase in steam flow will cause RCS Tave to decrease which in turn causes power to increase. The amount of Tave decrease is dependent on the severity of the steam leak and the moderator temperature coefficient. Pzr level and pressure will decrease as Tave decreases. As reactor power increases, a overpower rod stop may occur at 103 % NIS power range. At higher severity, the reactor may trip on low Pzr pressure, or a turbine runback may occur on OTΔT. A safety injection may occur due to low steam line pressure. When a SI occurs from low steam line pressure, the MSIV's close to isolate the break.

At approximately 15 % severity or less, the hotwell makeup can keep up with the steam mass loss out the break, but higher severity the hotwell level will drop.

The simulator must be reset to recover from this malf:

B. Main steam line break on # 2 steam line w/ similar results as MS02A.

C. Main steam line break on # 3 steam line w/ similar results as MS02A.

D. Main steam line break on # 4 steam line w/ similar results as MS02A.

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

The following ANN's are associated with this malf"

4B-24 "NIS POWER RANGE OVERPOWER ROD WITHDRAWAL STOP"
3C-10/24 "STM GEN # __ LEVEL HI" (Possible)
11/24
12/26
13/27
4D-26 (Possible)"PZR LOW PRESSURE RX TRIP"
4D-22 (Possible)"RX TRIP LOW STEAMLINE PRESS SAFETY INJ"
6A-23 "OVERPOWER AT AUTO TURB RNBK BLK C-4 ROD WRDL"
6B-2(9,16,23) "LOW ST LINE PRESS LOOP 1(2,3,4)"
5A-21 (Possible)"STEAM LINE STOP VLVS CLOSED"

References:
Annunciator Response
E-2
47W801; 47W610-1; 47W611-1,99; 47W611-63

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-21-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: FW23 - Main feedwater break (inside containment) caused by pipe break at steam generator inlet.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. FW23 was tested at 1 through 100% severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-21-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate. N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

FW23 MAIN FEED WATER BREAK INSIDE CONTAINMENT

TYPE: RV Generic Variable: 100 % = 6000 gpm @ normal operating pressure

CAUSE: Pipe Break at S/G Inlet

PLANT STATUS: IC-10

EFFECTS: Main Feed Water Break Inside Containment

A. # 1 S/G FW inlet pipe breaks @ input severity. # 1 S/G level decreases and the inlet feed water flow increases. # 1 S/G pressure decreases. The S/G water mass is lost by blowing out break into containment which causes the containment pressure, humidity, and sump level to increase. These changes are dependent on the severity. At higher severity, the Rx will trip on either Low Low S/G level or Hi containment pressure SI. High containment pressure will cause a feed water isolation which will prevent feeding the break from the feedpump side. If containment pressure reaches 2.81 psid, containment spray will initiate. Only one S/G will blowdown to containment. The RCS temperature will drop as long as the cooling effect from S/G blowdown exceeds The decay heat.
Malf removal restores piping integrity.

B. # 2 S/G FW inlet pipe breaks @ input severity w/ similar results as malf FW23A.

C. # 3 S/G FW inlet pipe breaks @ input severity w/ similar results as malf FW23A.

D. # 4 S/G FW inlet pipe breaks @ input severity w/ similar results as malf FW23A.

The following ANN's are associated with this Malf:

6E-20 "ICE CNDSR LWR INLET DOOR OPEN"
5C-10 "LWR COMPT MOISTURE HI"
5C-8 "LOWER CNTMT TEMP HI"
6B-6 "CNTMT HI PRESS SI ACTUATE"
4D-15 "CNTMT PRESS HI SAFETY INJ RX TRIP"
4D-3(8,13,18) "S/G LOOP 1(2,3,4) LEVEL LO-LO RX TRIP"

Reference:

Annunciator Response
47W610-3; 47W611-3,63,99
E-1, E-2

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-30-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RDT 7 - Dropped rod (failure of stationary gripper coil feature).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RD07 DROPPED ROD

TYPE: RB GENERIC

A. F-6 (Control Bank C)
B. C-5 (Shutdown Bank D)
C. F-14 (Control Bank B)
D. H-12 (Control Bank D)

CAUSE: Stationary gripper coil feature.

PLANT STATUS: IC-10

EFFECTS: Single dropped RCCA

A) RCCA F6 stationary gripper coil fails. RCCA F6 drops into the core. RPI and ROD bottom bistable indicate RCCA F6 fully inserted into the core. Reactor power indicates a prompt negative drop. The reactor may trip due to 2/4 NIS power range negative rate trip. At lower power, the reactor will not trip. The dropped rod cannot be retrieved while the malf remains active.

NIS indicates a flux tilt with the lowest power indication at the excore detector(s) nearest the dropped rod.

Malf removal restores the faulted gripper coil to normal and the RCCA can be withdrawn.

The following ANN's are associated with this malf:
4B-28 "FULL LENGTH RODS RODS AT BOTTOM"

E) Similar to RD07A except for RCCA C-5 in shutdown bank D

C) Similar to RD07A except for RCCA F-14 in control bank B

D) Similar to RD07A except for RCCA H-12 in control bank D

References:
AOI-2
Annunciator Response

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-28-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: ED12 - Loss of 125v DC vital battery board due to board fault.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. Tested for all four boards.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-28-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: The following DRs were written:

DR #186 - DC power supplies to various boards

DR #187 - Steam generator #1 power operated relief valve power supply.

DR #188 - DC power supplies.

DR #189 - Steam generator #4 power operated relief valve power supply.

5.2 Corrective Action Plans/Dates: All four DRs have been corrected and are ready for recheck. All will be completed prior to 5/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS
ED12	LOSS OF 125VDC VITAL BATTERY BOARD

TYPE: RB GENERIC
A. 125 VDC VITAL BATTERY BD I
B. 125 VDC VITAL BATTERY BD II
C. 125 VDC VITAL BATTERY BD III
D. 125 VDC VITAL BATTERY BD IV

CAUSE: Board fault

PLANT STATUS: IC-10

EFFECTS: A) 125VDC vital bat bd 1 deenergizes from a board fault. Bat Bd voltmeter indicates zero volts. Breaker position lights for feeders from 6.9KV SD bd 1A-A, and 480V SD BD's 1A1-A/1A2-A will deenergize.

Loss of vital bat bd 1 affects the listed systems:

- Control pwr for train A components
- 125VDC vital pwr to SOV'S and values w/ 125 DC solenoids
- 6.9KV and 480 breakers control pwr (no bkr control)

All Loops FW regulating valves close. Loops 2 & 4 bypass regulating valves fail closed. Steam dump valves fail closed and D/G's start.
A reactor trip results from loss of feedwater flow.

Clearing the malf allows the faulted bat bd to be reenergized from either battery or charger, thus restoring the faulted battery bd to normal.

B) Similar to A except all control air compressors unload and S/G Loops 1 & 3 FW Reg. bypass valves close.

C) 125 VDC Vital Battery Bd. III deenergizes from a fault. Battery board volt meter indicated 0 volts. Will lose breaker position lights for feeder breakers feeding from 6.9 KV SD Bd. to 480 V SD transformers. Will lose Terry Turbine T&T valve power supply. No Rx trip will occur.

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

ED12 (Cont)

D) 125 VDC Vital Battery Bd IV deenergizes from a fault. Battery board volt meter indicated 0 volts. There is only minor effects on Unit 1. (Ventilation dampers; Aux. Bldg. Hydrogen Supply; and D/G's start).

References:

AOI-21.1, 21.2, 21.3, 21.4 list the Annunciations and effects of loss of Vital Batteries.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-31-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: NI07 - Power range channel output signal failure.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. NI07 was tested for all four NI power range channels from 0 to 120%.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-31-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

NI07 PR CHANNEL OUTPUT SIGNAL FAILURE

TYPE: RV GENERIC VARIABLE: 100% = 120% POWER
A. PR CHNL 1
B. PR CHNL 2
C. PR CHNL 3
D. PR CHNL 4

CAUSE: Channel Output Signal Failure

PLANT STATUS: IC-10

EFFECTS: Power range channel signal failure.

A) PR channel N41 fails to the selected severity.(103 % power = 103 % severity. The upper and lower detector amp meters are not affected. The listed functions are initiated as shown below:

10% P10 (2/4 channels inc. power)
[illegible] % Channel deviation signal (high to low)
109 % Hi flux (2/4 Rx Trip)
35% P8 (2/4 inc. power-changes flow trip)
50% P9 (2/4 inc. power- Trip Turbine)
103% Over power rod stop (1/4 channels)
Over Temp delta T Trip setpoint (2/4)

This malfunction has no effect on delta flux indication. Rod out motion is stopped if failed ≥ 103 %.
(Note: This malf overrides malf N108 & N109 indication from summing unit)
Malf. removal returns channel to normal.

B, C, & D) Generics are similar

The following ANN'S are associated w/ this malf:
4B-31 "NIS Power Range Channel Deviation"
6A-8 "NIS Power Range High Neutron Flux Rate"
6A-15 (Possible)" NIS Pwr Range Low Setpoint High Flux Level"
6A-22 (Possible)" NIS Pwr Range High Setpoint High Flux Level"
References"
Annunciator Response
47W611-[illegible] series

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: HD12 - #1 feedwater heater level control fails low (level controller failure/LCV fails closed). Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. HD12 was tested for a, b, and c.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: Two DRs were written:
DR #217 - alarm in at same time feedwater heater isolates.
DR #218 - "Simulator out of bounds" alarm came in.

5.2 Corrective Action Plans/Dates: DR #217 is a level switch adjustment and will be completed by 6/1/91. DR #218 was an adjustment to the "Simulation out of limits" alarm and is corrected and closed.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

MD12 #1 FEED WTR HEATER LVL CONTROL FAILS LO

TYPE: RB GENERIC
A. LIC-6-15 (Heater A-1)
B. LIC-6-35 (Heater B-1)
C. LIC-6-58 (Heater C-1)

CAUSE: Level Controller Failure, Level Control Valves Fails Closed

PLANT STATUS: IC-10

EFFECTS: Loss of single #1 FW heater

A) A-1 FW Htr level controller, LIC-6-15, fails Lo. Level control valves, LCV-6-15 A&B close (normal drain and bypass to condenser). A-1 FW heater level increases causing A-1 FW heater feedwater outlet temperature to decrease. Feedwater temperatures to S/G'S decrease. RCS T-AVE decreases w/ corresponding increase in RX power. Feedwater heater isolates on hi-hi lvl. Plant stabilizes with higher RX pwr.

Malf removal allows controller to operate as necessary to bring heater level down to normal.

B) B-1 feedwater heater level controller, LIC-6-35, fails lo w/ similar results as malf HD12A except B-1 high pressure heater isolates on high level.

C) C-1 feedwater heater level controller, LIC-6-58 fails lo w/ similar results as malf HD12A except C-1 high pressure heater isolates on high level.

The following ANN's are associated with this malf:

2B-29 "High Pressure Heater A-1 Level Abnormal"
2B-30 "High Pressure Heater B-1 Level Abnormal"
2B-31 "High Pressure Heater C-1 Level Abnormal"

References:
47W803; 47W805; 47W610-3,6; 47W611-3,6
Annunciator Responses

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-20-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: CN09 - Loss of condenser vacuum ,e to leak.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoy. Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. Tested from 1% through 100% severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-20-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS
CN09	LOSS OF VACUUM
TYPE:	RV DISCRETE VARIABLE 1003 = 1000 CFM @ 15 PSID
CAUSE:	Vacuum leak
PLANT STATUS:	IC-10
EFFECTS:	Assume one condenser pump is in service with one pump in standby. Each pump is rated for 15 SCFM in the holding mode and 1000 SCFM in the hogging mode at 15 inches HG absolute. As the leakrate increases, condenser vacuum will start decreasing in proportion to the leakrate. Turbine generator megawatt output will also decrease as vacuum decreases. At 2.7 psia inches a low condenser vacuum pump will automatically start which will slow the rate of vacuum decrease. Discharge air temp on the vacuum pumps will decrease and eventually actuate a hi temp alarm. Between 3.9 & 5.9 psia at a turbine trip will occur and if initial load is above P-9 a reactor trip will result. This will result in the normal plant transient occurring due to a reactor trip. When condenser vacuum drops to 3.4 psia, a condenser interlock is actuated preventing steam dump to the condenser. Operator will have to use the pwr operated relief vlvs to cntrl RCS temp. The larger the leakrate, the faster condenser vacuum will decrease. MFP trips at 12.2 PSIA Instuctor will have to remove this malf. to reestablishe condenser vacuum.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-4-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: CV15 - Charging flow control problem resulting in pressurizer level swing (FCV-62-93 diaphragm leak). Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial cond' ion to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observec nd pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS
CV15	CHARGING FLOW CONTROL PROBLEM, PZR LVL SWING
TYPE:	RB DISCRETE
CAUSE:	FCV-62-93 Diaphragm leak. Closing stroke-time increases by four (4) times
PLANT STATUS:	IC-10
EFFECTS:	PZR lvl (control) swing

The charging flow control FCV-62-93 diaphragm develops a leak, causing the FCV'S "close' stroke time to increase by (4) times normal. "Open" stroke time is not affected (fail open). FCV continues to respond to all level control signals.

Pzr level trace oscillates slightly above normal level set point. Manual control resolves the oscillation trend.

Malf removal restores the FCV-62-93 diaphragm to normal.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-30-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RP02 - Auto Safety Injection initiation signal failure (SSPS failure).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria establisned in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selec ed to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. RP02 was tested for all conditions that would generate a safety injection signal.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-30-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RP02 AUTO SI INITIATION SIGNAL FAILURE

TYPE: RB DISCRETE

CAUSE: SSPS Failure

PLANT STATUS: IC-10

EFFECTS: Failure of SI to initiate from an auto signal.

The listed automatic SI signals will not initiate the SI sequence while this malfunction is active:

Low Steamline Pressure
Low Pressurizer Pressure
Hi Containment Pressure

Manual initiation of SI is unaffected, and remains available. All SI components may be started manually. The following "S" junctions are defeated:

Reactor trip signal from SI
Containment Isolation signal
FW Isol. signal from SI
Pzr heater off signal
Emerg D/G start signal from SI

Note: MSIV isolation signal logic is still operable.

Malfunction removal allows SI to initiate from any auto signal.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-17-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: IA03 - Loss of essential control air due to line rupture downstream of auxiliary control air receiver.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-17-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #154 was written to report failure mode for auxiliary feedwater valves for train A and train B are reversed.

5.2 Corrective Action Plans/Dates: DR #154 is an air supply assignment problem and will be corrected by 5/1/91.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

IA03 LOSS OF ESSENTIAL CONTROL AIR

TYPE: RB Generic
A. Train A
B. Train B

CAUSE: Line Rupture Downstream of Aux. Control Air Receiver

PLANT STATUS: IC-10

EFFECTS: Loss of essential control air

A. Aux control air line breaks downstream of train A air receiver. Air system pressure decreases from approximately 100 psig. At approximately 88 psig, service air isolates from control air (PCV-33-4). At approximately 75.5 psig, the auxiliary air compressors start. At approximately 68 psig, FCV-32-82 and FCV-32-85 close to isolate non-essential air from essential air and train B essential air pressure returns to normal. The train A air pressure continues to fall. Train A air to containment (FCV-32-80), closes due to loss of air pressure at approximately 50 psig.

The major equipment effected by Train A air are as follows:

1. AFW (motor) big LCV's fail open S/G's 1 & 2
2. AFW (motor) small LCV's fail close S/G's 1& 2
3. AFW (turb.) LCV's fail closed S/G's 3 & 4
4. S/G PORV's fail closed S/G's 1 & 3
5. Pzr spray valve fails closed loop 1
6. Train A ABGTS & EGTS dampers
7. Train A Control Bldg. A/C & Vent

B) Aux control air line breaks downstream of train B air receiver w/ similar results as malf IA03A w/ opposite train valves and dampers being affected.

The following ANN's are affected by this malf:
15B-4 "TRAIN A AUX CONTROL AIR PRESS LO"
15B-11 "TRAIN B AUX CONTROL AIR PRESS LO"
15B-28 "SERVICE AIR ISOLATION CLOSED"

References:
Annunciator Response
AOI-10C; 47W848 series; 47W610-32

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-31-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: RD08 - Rods fail to move on demand due to master cycler output failure.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. RD08 was tested for manual, bank select, and shutdown.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-31-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

RD08 RODS FAIL TO MOVE ON DEMAND

TYPE: RB Discrete

CAUSE: Master Cycler Output Failure

PLANT STATUS: IC-10

EFFECTS: Rod Motion Failure

The master cycler fails, alarming, "ROD DRIVE CONTROL SYSTEM URGENT FAILURE". All control rods are unresponsive. Only shutdown rods in bank C & D will move in "Bank Select" position with rod selector switch. The control rods will not move for any auto or manual signal while the malfunction is active.

The reactor protection system is not affected. All rods will trip into the core if Rx trip breakers open.

Malf removal restores the master cycler to normal.

The following ANN's are associated with this malf:

4B-6 "ROD CONTROL SYSTEM URGENT FAILURE"

Reference:

Annunciator Response

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-5-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: TH09 - Fuel cladding failure (manufacturing defect).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-5-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #219 was written to report that area and containment radiation monitors did not increase as reactor coolant system activity increased.

5.2 Corrective Action Plans/Dates: DR #219 will be completed by 6/1/91 as part of a major tuning and adjustment to the containment radiation model.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS
TH09	FUEL CLADDING FAILURE
TYPE:	RVI DISCRETE VARIABLE: 100 % = 1 % Cladding Failure
CAUSE:	Manufacturing Defects of Fuel
I ANT STATUS:	IC-10
EFFECTS:	Fuel Cladding Failure

Fuel cladding fails at input severity; RCS and CVCS activity increases as severity increases. Containment area RAD monitors increase. Activity and background RAD levels stabilizes with elevated radiation levels in the RCS and direct flow inter-connected systems and area RAD monitors in close proximity to affected systems. This malfunction can be utilized in conjunction with other malfunctions that produce RCS leaks into containment or Aux. Bldg.

Malfunction removal restores fuel cladding integrity.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-30-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: FW20 - Feedwater line break on common header downstream of #1 heaters (Turbine Building).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-30-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: DR #203 - FCV-3-23 #1 heater isolation valve will not close from handswitch.

5.2 Corrective Action Plans/Dates: DR #203 will be worked by 5/1/91 and involves a minor hardware fix.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

FW20 FEEDWATER LINE BREAK IN TURBINE BLDG.

TYPE: RV Discrete Variable: 100 % = 12 X 10^6 #/Hr @ 1200 psid

CAUSE: Failure of Common Header, Downstream of # 1 Heater

PLANT STATUS: IC-10

EFFECTS: Feed Line Break

Feedwater line breaks on common header downstream of # 1 heaters at input severity. Feedwater flow to all S/G's decrease. All S/G levels start to decrease and a feed flow/feed flow mismatch develops for all S/G's. As severity increases, the mismatch becomes greater and S/G levels decrease more rapidly. The plant will trip at the Low-Low S/G level setpoint. A feedwater isolation and main feedwater pumps trip occur upon reaching low T-ave (550 ° F)

Malfunction removal restores the piping integrity.

The following ANN's are associated with this malf:

6B-1,8,15,22 "S/G LOOP __ LOW FW FLOW LOW WATER LEVEL"
6B-4,11,18,25"S/G LOOP __ LOW LOW WATER LEVEL"
3C-2,9,16,23 "S/G LOOP __ LO LO LEVEL"

References:

47W610-3; 47W611-3
Annunciator Response

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-6-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: NI04 - Intermediate range channel failure (log level amp signal failure).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-6-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

NI04 I R C H A N N E L F A I L U R E

TYPE: RV GENERIC VARIABLE: 100% = FULL SCALE 200% POWER
30% = 1 X 10 -5 % power
20% = 1 X 10 -6 % power

CAUSE: Log Level Amp Signal Failure

PLANT STATUS: IC-8

EFFECTS: Faulty IR Power Level Output for single IR channel.

A) Control board meter indicates power level at failed value. Channel start up rate indications spikes due to sudden change in channel output. The listed responses are indicated (severity dependent);

Trip (25 % power - 1/2 channels) If not blocked
Rod-stop (20 % power - 1/2 channels) If not blocked
P6 (single channel- 1/2 inc. power; 2/2 dec power)

Local test of the faulted channel, while the malf is active, will indicate the malf-signal as sensitive to the level test signal. SUR test signals are unaffected.

Malf removal restores the channel to normal.

The following ANN'S are associated w/ this malf:

4B-9 "Intermed Range Hi Flux Lvl Rod Withdrawal Stop"
4A-23" (possible) P-6 Intermediate Range Permissive"

B) IR channel N36 power level responds to the selected severity w/similar results as malfunction NI04A.

References:
47W611-99 series
Annunciator Response

NT-P-7.3.1-S
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-17-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: CV01 - Charging pump trip caused by faulty 50 relay (instantaneous overcurrent).

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. Both A and B pumps were tested.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 1-1/-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

CV01 CHARGING PUMP TRIP

TYPE: GENERIC
A. PUMP A
B. PUMP B

CAUSE: Faulty 50 relay (Instantaneous overcurrent)

PLANT STATUS: IC-10

EFFECTS: Loss of single centrifugal charging pump (Only pump in service)

A) Charging pump 1A-A trips. White light and alarm indicate trip status. Amps, pressure, and charging flow decrease to zero. Letdown orifice valves close and RCP seal supply flow stops. (Note: buzzer sounds w/ this malf and can be stopped & white light extinguished by taking pump control switch to stop)

RCP seal water supply flow goes to zero
RCP lower bearing temp increases slightly
RCP #1 seal outlet temp increases slightly
Charging header pressure decreases
Charging header flow goes to zero
Letdown isolates due to closed orifice valves

Charging pump 1A-A cannot be started with malfunction active.

Malf removal restores the faulted 50 relay to normal. and 1A-A centrifugal pump can be restarted.

B. Charging pump 1B-B trip. w/ similar results as CV01A.

The following ANN's are associated w/ this malf:

1B-31 Motor Tripout Pnl 1-M-1 thru 1-M-6
5B-17 RCP's Seal Water Flow Lo
6C-24 Charging Line Flow Abnormal

NT-P-7.3.1-8
Appendix D
Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-5-91

1.0 Test Description and ANS 3.5 References.

1.1 Description: CV16 - Mechanical failure of letdown line relief valve (RV-62-662) at 600 psid.

Test results were documented on the Malfunction Testing Forms in which test personnel addressed the various performance criteria established in the standard. The original Malfunction Testing Forms are retained on file at the Sequoyah Training Department as test data.

1.2 ANS 3.5 Reference: 1985 sections 3.1.2, 3.3, 3.4, 4.3, 4.4, and Appendix A3.

2.0 Available and Tested Options

2.1 Some of the tested malfunctions affect only one component; others can be selected to affect different or even multiple components of a redundant system. Many of the malfunctions can be selected to various degrees of severity. CV16 was tested at 50% and 100% severity.

2.2 When appropriate operator actions would be determined by the degree of severity of the malfunction, the test was performed at two or more degrees of severity. Malfunctions which can be selected to affect different redundant components of a system were tested on one component. When annual retests are performed for this type of malfunction, a different component will be selected each year.

Procedure Number: NT-P-7.3.1-8, Att. 5
Date Conducted: 2-5-91

3.0 Test Conditions and Parameters

3.1 This malfunction was inserted using an appropriate initial condition to satisfy the Malfunction Cause and Effect document (attached).

3.2 Tests continued until the conditions stated in the Malfunction Cause and Effect document had been observed and pertinent plant parameters had stabilized.

3.3 Data Collection Description

3.3.1 Sample Rate: N/A

3.3.2 Test Parameter Description: N/A

4.0 Baseline Data Description: Baseline data consists of the Malfunction Cause And Effect document. This document, which was compiled using reference material from the simulator design database, gives a brief description of the cause of the problem and its effects from a particular initial condition.

5.0 Test Evaluation

5.1 Deficiencies Found During Test: None.

5.2 Corrective Action Plans/Dates: None.

5.3 Exceptions Taken: N/A

TVA SEQUOYAH NUCLEAR PLANT

MALFUNCTION CAUSE AND EFFECTS

MALF. NO.	MALFUNCTION TITLE / RANGE / CAUSE & EFFECTS

CV16 LETDOWN LINE RELIEF VALVE FAILS; RV-62-662

TYPE: RV DISCRETE VARIABLE: 100% = 200GPM @ 600 PSID

CAUSE: Mechanical failure of RV-62-662 at 600 lbs

PLANT STATUS: IC-10

EFFECTS: Letdown orifice relief valve failure

Relief valve 62-662 (down stream of letdown orifices) relieves to the PRT at the selected GPM severity. Affects to the PRT are indicated as an increase in press, temp, and level. Letdown relief tailpipe temperature increases. Max severity is limited by the in service orifices. The letdown press control PCV-62-81 modulates closed to maintain pressure set point. Indicated letdown flow decreases approximately equal to selected severity. VCT level trace indicates an increased RCS leak-rate. The faulted relief valve can be isolated by closing the letdown orifice valves.

Malf removal restores the relief valve to normal

The following ANN'S are associated w/ this malf:

- 5A-08 PRT level Hi-Low
- 5A-15 PRT Temp High
- 5A-22 PRT Press High
- 6C-18 Low Press Letdown Relief Temp High
- 6C-03 VCT Level Hi-Low

References:

- Annunciator Response
- 47W809-1
- 47W813-1

TENNESSEE VALLEY AUTHORITY
NT-P-7.3.1-8
Attachment 1
Table 1 - Simulator Certification Testing Schedule
Plant - Unit SQN-1

Initial Certification March 1991
Date Submitted

Four-year Test Period March 1, 1991/March 1, 1995
Date Start/Date End

Annual Test March 1, 1991/March 1, 1992
Date Start/Date End

Annual Test Period	Test Description		Test Date	
	Procedure Number	(A) Procedure Name (1) Procedure Type (a) Particular Test	Planned Start	Completed
1	NT-P-7.3.1-8 Attachment 2	A) Simulator Steady State Test	12/01/91	
	Attachment 3	B) Normal and Abnormal Operating Plant Instructions Tests. First year: General Operating Instructions	09/01/91	
	Attachment 4	C) Simulator Transient Performance Tests.	10/01/91	
	Attachment 5	D) Malfunction Tests. First 25% of certified malfunctions.	11/01/91	

TENNESSEE VALLEY AUTHORITY
NT-P-7.3.1-8
Attachment 1
Table 1 - Simulator Certification Testing Schedule
Plant - Unit SQN-1

Initial Certification March 1991
Date Submitted

Four-year Test Period March 1, 1991/March 1, 1995
Date Start/Date End

Annual Test March 1, 1992/March 1, 1993
Date Start/Date End

Annual Test Period	Test Description		Test Date	
	Procedure Number	(A) Procedure Name (1) Procedure Type (a) Particular Test	Planned Start	Completed
2	NT-P-7.3.1-8 Attachment 2	A) Simulator Steady State Test.	12/01/92	
	Attachment 3	B) Normal and Abnormal Operating Plan: Instructions Tests. Second Year: General Operating Instructions	09/01/92	
	Attachment 4	C) Simulator Transient Performance Tests.	10/01/92	
	Attachment 5	D) Malfunction Tests. Second 25% of certified malfunctions.	11/01/92	

TENNESSEE VALLEY AUTHORITY
NT-P-7.3.1-8
Attachment 1
Table 1 - Simulator Certification Testing Schedule
Plant - Unit SQN-1

Initial Certification March 1991
Date Submitted

Four-year Test Period March 1, 1991/March 1, 1995
Date Start/Date End

Annual Test March 1, 1993/March 1, 1994
Date Start/Date End

Annual Test Period	Test Description		Test Date	
	Procedure Number	(A) Procedure Name (1) Procedure Type (a) Particular Test	Planned Start	Completed
3	NT-P-7.3.1-8 Attachment 2	A) Simulator Steady State Test.	12/01/93	
	Attachment 3	B) Normal and Abnormal Operating Plant Instructions Tests. Third Year: Emergency Instructions.	09/01/93	
	Attachment 4	C) Simulator Transient Performance Tests.	10/01/93	
	Attachment 5	D) Malfunction Tests. Third 25% of certified malfunctions.	11/01/93	

TENNESSEE VALLEY AUTHORITY
NT-P-7.3.1-8
Attachment 1
Table 1 - Simulator Certification Testing Schedule
Plant - Unit SQN-1

Initial Certification March 1991
Date Submitted

Four-year Test Period March 1, 1991/March 1, 1995
Date Start/Date End

Annual Test March 1, 1994/March 1, 1995
Date Start/Date End

Annual Test Period	Test Description		Test Date	
	Procedure Number	(A) Procedure Name (1) Procedure Type (a) Particular Test	Planned Start	Completed
4	NT-P-7.3.1-8 Attachment 2	A) Simulator Steady State Tests.	12/01/94	
	Attachment 3	B) Normal and Abnormal Operating Plant Instructions Tests. Fourth year: Abnormal Operating Instructions	09/01/94	
	Attachment 4	C) Simulator Transient Performance Tests.	10/01/94	
	Attachment 5	D) Malfunction Tests. Fourth 25% of certified malfunctions.	11/01/94	