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January 11, 1999

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Calvert Cliffs Simulator Certification Four-Year Report of Uncorrected
Performance Test Failures

In accordance with 10 CFR 55.45(b)(5)(ii) and 10 CFR 55.45(b)(5)(vi) please find enclosed the four-year Certification Report of Uncorrected Performance Test Failures for the Baltimore Gas and Electric Company Calvert Cliffs Simulation Facility.

Since the certification resubmittal on January 10, 1995, all tests have been completed in accordance with the attached audit. All performance test failures have been corrected to date.

Should you have any questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,

CHC/TWG/bjd

Enclosure: (1) Calvert Cliffs Nuclear Power Plant Simulator Four-Year Certification Report
Attachments: (1) Calvert Cliffs Unit One - Reference Plant Simulator Dual Unit
Simulator - Checkoff Sheet
(2) Calvert Cliffs Unit One - Reference Plant Simulator Dual Unit
Simulator

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ENCLOSURE (1)

CALVERT CLIFFS NUCLEAR POWER PLANT SIMULATOR FOUR-YEAR CERTIFICATION REPORT

I. INTRODUCTION

The Calvert Cliffs Nuclear Power Plant Simulator Four-Year Certification Report is a supplement to the Simulation Certification Form [Nuclear Regulatory Commission (NRC) Form-474, (Reference 1)], the Simulator Annual Certification Report, and Simulator Support Unit Procedures. This report briefly provides a description of the simulator, the Certification Resubmittal Checklist and a current status of simulator configuration modifications. Additional information concerning specific tests is available upon request. The last report was submitted January 10, 1995.

II. SIMULATOR INFORMATION

Simulator type:	Reference Plant Simulator
Manufacturer:	Combustion Engineering
Owner/Operator:	Baltimore Gas and Electric Company (BGE)
Reference Plant:	Calvert Cliffs Unit One
Plant Location:	Lusby, Maryland
Plant Type:	Pressurized Water Reactor
Plant Rating:	2700 Mwth
Date Available for Training:	January, 1985
Original Certification Date:	January 11, 1991
Type of Report:	Four-Year Certification
Applicable Standards:	
Design/Testing:	American National Standards Institute (ANSI)/ American Nuclear Society (ANS) 3.5-1985 (Reference 2) NRC RG 1.149-1987 (Reference 3)

III. SIMULATOR PROCEDURES

The Simulator is controlled, operated, tested, and modified using the following Calvert Cliffs procedures:

- EN-1-100, Engineering Service Process Overview
- EN-1-110, Control of Reload Core Design
- MD-1, Modifications Program
- MN-1-100, Conduct of Maintenance
- MN-1-200, Maintenance Order Planning
- NO-1-102, Calvert Cliffs Operating Manual
- NO-1-109, Curtailment of Unessential Building Loads
- NO-2, Reactivity Management
- PR-1-101, Preparation and Control of Calvert Cliffs Technical Procedures
- Licensing and Regulatory Matters (RM) Program
- TR-1, Training Program
- TG 14, Calvert Cliffs Simulator Facility Configuration Management
- Unit Controlled Procedure, Simulator Configuration Manual

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IV. SIMULATOR DATABASE

Controlled drawings and procedures are used as a basis for handler logic and system flow calculations. The plant setpoint file is also used as an input to the simulator data base. Plant or Simulator Support Unit logs are used whenever possible to compare initial condition values. Plant or Engineering data is used when necessary to ensure the simulator data base closely models the plant. Feedback from plant operators, using the Simulator Issue Report (SIR) process, is an essential part of maintaining the simulator current with the plant.

V. DEVIATIONS SINCE LAST REPORT

Test Plan: In February 1995, it was determined that Malfunction 95 "Steam Generator Level Transmitter Fails Hi/Lo" (Year 1), changed to Malfunction 99, was not included in the Year 1 Testing schedule submitted. It was tested in Year 1 and is included in this submittal.

Year 1 (1995) Malfunction Testing: In 1996, it was discovered that fourteen malfunction tests (13.3% of all testing performed that year) were missing. Follow-up testing was performed in 1996 (1 test) and 1998 (13 tests). All follow-up testing was satisfactory. This is being resolved by use of electronic documentation.

Year 2 (1996) Malfunction Testing: In 1998, it was discovered that five malfunction tests were missing. Follow-up testing was performed in 1997 (2 tests) and 1998 (3 tests). All follow-up testing was satisfactory. This is being resolved by use of electronic documentation.

Real Time Test: Questionable results were noted in the "Real Time Test" between the Perkin-Elmer and the Silicon Graphics (SGI) computers. As a result, (also due to the increased capacity and speed of the new computers) in 1996 and 1997 we did not perform a "Real Time Test." A better and more conclusive test for use in 1999 is being developed.

Year 3 (1997) Testing: In 1998 it was discovered that the annual "drift" test and three malfunction tests were missing. Follow-up testing was performed in 1998. All follow-up testing was satisfactory. This is being resolved by the use of electronic documentation.

Change in Test Plan Due to Modification Installation: In December 1997, the future reference plant digital feedwater modification was incorporated in the simulator. Three digital feedwater malfunctions from Year 4 were tested as a part of this modification. These malfunctions (097, 173, and 181) were not retested in Year 4.

No additional major differences exist between the simulator and the reference plant.

VI. MAJOR CHANGES SINCE THE LAST REPORT

Simulator Emergency Lighting: In 1995, the simulator emergency lighting was upgraded to match the reference plant Control Room.

Computer Replacement Project: The computer platforms were changed from Perkin-Elmer (Concurrent) to SGI in 1995. This project DID NOT include upgrades to or replacement of

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CALVERT CLIFFS NUCLEAR POWER PLANT SIMULATOR FOUR-YEAR CERTIFICATION REPORT

simulator models. A new instructor station interface with the computers was included. Minimum effect on training occurred during this project due to the capability to switch from one platform to the other. Training was conducted on the old computers until the SGI computers were certified for use. Training on the SGI computers began January 22, 1996.

Action Item Tracking of Modifications: In 1996, modification tracking was documented using the site's Action Item Tracking system. Simulator Support personnel add milestones to the Engineering Service Package tracking, when the simulator is affected by a modification. This eliminated the need to track modifications by a Simulator Maintenance Order and lets the project manager know what Simulator Support needs to modify the simulator.

Model Execution Frequency: In 1997, the model frequency was increased from 1 HZ to 5 HZ. All annual tests were run to support this modification to the models. Some differences were noted in model response and were addressed and documented.

Electronic Documentation of Testing: In 1997, as a result of our internal audit of certification, our malfunction tests are documented electronically, resolving the issue of missing tests. Malfunction testing will be documented as a part of the "Cause and Effects" documents which are a part of the Calvert Cliffs Simulator Instructor Station. This results in the following enhancements:

- The "Cause and Effects" documents are updated after every test.
- The tests are more reliable because current plant procedures or engineering documents are being used. This provides an effective means to identify and correct simulator deviations from the plant.
- Instructors will know how and when the malfunction was last tested.

Simulator Issue Report Format: During this cycle, the SIR format was changed from the Site's "Issue Report" format to a more direct and customer oriented format. This resulted in the "MAJOR Simulator Fidelity" category being eliminated. This determination is now made through assigning priority rather than by the customer.

VII. MAJOR CHANGE MILESTONES OCCURRING WITHIN THE NEXT YEAR

Simulator Certification progression to ANS 3.5-1998.

Development of a procedure to update the core model to the current core cycle.

Modification to the service water heat exchangers per reference plant.

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**CALVERT CLIFFS NUCLEAR POWER PLANT SIMULATOR
FOUR-YEAR CERTIFICATION REPORT**

VIII. OUTSTANDING ITEMS FROM LAST SUBMITTAL

The following discrepancies have not been corrected. These are not performance test failures.

<u>SIR No.</u>	<u>Discrepancy</u>	<u>Corrective Actions</u>
8199100443	Trap door on circulating water traveling screens is not modeled in Malfunction 221	Working Status. Modeling above 40 inches is affected. Operator is expected to stop the circulating water pump prior to this point.
8199300071	Nuclear instrument (NI) response too sensitive during large break loss-of-coolant accident (LOCA) Malfunction 38	Moving to Under Investigation. Simulator was tuned for the Three Mile Island response. Originator is questioning the intensity of this response. Engineering support needed.
8199300209	Load limit potentiometer causes load to jump when it is taken from 0.347 to 0.348	Working Status. This is a point where the control valve area curve changes. We have been investigating plant drawings for resolution, but have found no solution.
S3367	Include other transmitter failures under Malfunction 95	Documentation missing. This malfunction was changed to Malfunction 99. All steam generator level control transmitter failures are included in Malfunction 99. No further action is required.
S3433	New secondary control element assembly (CEA) display indicates CEA at 136 vice 0	Never initiated. Simulator is like the reference plant.

IX. CERTIFICATION TESTING CHECKLIST

The attached Calvert Cliffs Nuclear Power Plant Simulator Certification Report Checkoff Sheet [Attachment (1)] indicates the audit completed to maintain simulator certification. Specific data is available upon request.

Certification tests are divided into three groups:

Annual Tests	-	Performed each year
Performance Tests	-	Performed over a four-year period
Malfunction Tests	-	25% per year in accordance with the testing schedule

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CALVERT CLIFFS NUCLEAR POWER PLANT SIMULATOR FOUR-YEAR CERTIFICATION REPORT

X. ADDITIONAL TESTING

SPIN Testing: Every time a "SPIN" (new training load) occurs, an integration test is run to ensure the changes are incorporated and do not detract from training. Testing includes: ANS B2 2a "Reactor Trip," ANS B2 2i "Main Steam Line Break" and ANS B2 2h "LOCA with Loss of Offsite Power." These tests exercise most of the computer models. Affected malfunction tests may also be used. Credit for malfunction testing is not considered in the Certification Testing.

Computer Replacement Project: Benchmark testing between the old Perkin-Elmer and the new SGIs computers, was conducted to ensure the continued certification of the Calvert Cliffs Simulator. Due to the delay in implementation, the actual testing included "Cold Shutdown to Hot Standby" and "Operation in Hot Standby" along with selected Malfunctions from Year 1. This is different from what was reported in the 1995 Certification Submittal. There is separate documentation available for certifying the SGI computers in the 1995 Annual Report.

Annual Test Schedule (beginning 1997): Milestone (MS) 002 "Steam Generator Tube Rupture (1.5 tubes)" and MS004 "11 Main Steam Isolation Valve (MSIV) Shuts" were added. Plant data supports MS002 and includes the condenser and **RMS** models which are not exercised in any other annual test. Milestone 004 was added due to problems noted in response during the computer replacement project testing (noted as a potentially vulnerable area in the modeling). American Nuclear Society-2K "Load Rejection" was added in order to benchmark future testing for ANS 3.5-1998. "Total Loss of All Feedwater" was also added. The Simulator matches Plant Engineering expected response. Since this has multiple malfunctions, it was placed in this category.

Year 2000 Testing: In September 1998 Year 2000 (Y2K) testing (with software patches) was conducted on the Simulator. The patches will be installed before February 1999. With the software patches, the Simulator will be Year 2000 compliant. Testing of peripheral computers (e.g., secondary CEA display and personal computers) will be conducted in accordance with the site Year 2000 schedule.

Malfunctions: New malfunctions were developed for use in training which are validated prior to use. No additional malfunctions have been added to our test plan.

ANS 3.5-1998: The simulator certification process is being reviewed for applicability to the 1998 standard.

XI. REFERENCES

1. Title 10, Code of Federal Regulations, Part 55, "Operators' Licenses"
2. ANSI/ANS 3.8-1985 American Nuclear Society "Nuclear Power Plant Simulators for Use in Operator Training"
3. United States Nuclear Regulatory Guide 1.149 "Nuclear Power Plant Simulation Facilities for Use in Operator License Exams," April 1987

ATTACHMENT (1)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR DUAL UNIT SIMULATOR -- CHECKOFF SHEET

- | | <u>INIT / DATE</u> |
|--|---------------------|
| 1. Review any deviations which occurred in testing since the last submittal. List these under Section V. | <u>EH</u> 1/12/9/98 |
| 2. Review SPIN and Annual Reports and list major changes since the last report. List these under Section VI. | <u>EH</u> 1/12/9/98 |
| 3. Review SPIN and Annual Reports for any changes to the simulator environment (lighting, painting, etc.) List these under Section VI. | <u>EH</u> 1/12/9/98 |
| 4. Review SPIN and Annual Reports for any major model changes, or model changes on SIRs which had "MAJOR Simulator Fidelity" checked. List these under Section VI. | <u>EH</u> 1/12/9/98 |
| 5. List all FCRs which were incorporated on the simulator since the last report. Have this list available for review. | <u>EH</u> 1/12/9/98 |
| 6. List any outstanding items to be completed within the next year. List these under Section VII. | <u>EH</u> 1/12/9/98 |
| 7. Verify Certification Documentation: | |
| a. List all tests since last report and include the dates they were run, Simulator Issue Reports written and resolution. | <u>EH</u> 1/12/9/98 |
| b. Verify testing was performed in accordance with the testing schedule last submitted or reasons for deviation documented in Section V. | <u>EH</u> 1/12/9/98 |
| c. List additional testing performed including SPIN tests. Include this in Section X. | <u>EH</u> 1/12/9/98 |
| 8. Review the previous submittal and list any discrepancies within the report which have not been resolved or are no longer applicable and their resolution. List these under Section VIII. | <u>EH</u> 1/12/9/98 |
| 9. Give up to date evaluation of the simulator: | |
| a. Have differences list available for review. | <u>EH</u> 1/12/9/98 |
| b. List any major differences between the reference plant and the simulator concerning panels, communications, furniture and plant computer. If differences exist which were not addressed in the original submittal, include them in Section V. | <u>EH</u> 1/12/9/98 |
| c. List all of the initial conditions. Ensure conditions under the original submittal are still being met. Have the list available for review. | <u>EH</u> 1/12/9/98 |
| d. Have the current active SIR list available for review. | <u>EH</u> 1/12/9/98 |
| e. Attach the test plan for the next four years. [Attachment (2)] | <u>EH</u> 1/12/9/98 |
| f. List any additional exceptions to the standard. | <u>EH</u> 1/12/9/98 |
| g. Review Examiners comments from exams performed including our reply. Have these available for review. | <u>EH</u> 1/12/9/98 |
| h. List any deviations from the standard. Include these in Section V. | <u>EH</u> 1/12/9/98 |

ATTACHMENT (1)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR
DUAL UNIT SIMULATOR -- CHECKOFF SHEET

- i. List the qualifications of persons who performed, reviewed or approved testing over the last four years (Contractors require a current resume):

Edmund A. Chrzanowski	Former Licensed SRO (CCNPP)
William B. Gunter	Licensed RO (CCNPP)
James E. Macklin	Licensed SRO (CCNPP)
Patrick S. Murphy	Former Licensed RO (CCNPP)
Richard A. Svendsgaard	Former Licensed RO (CCNPP)

EL 1/2/98

ATTACHMENT (2)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR DUAL UNIT SIMULATOR

ANNUAL TEST PLAN

ANS B2-1d	100% Power Drift Check
ANS B2-1f	Operability Check of Real Time Simulation
ANS B2-1a	25% Power Energy/Mass Balance
ANS B2-1b	50 ANS 3.8-1% Power Energy/Mass Balance
ANS B2-1c	75% Power Energy/Mass Balance
ANS B2-1d	100% Power Energy/Mass Balance
ANS B2-2a	Manual Reactor Trip
ANS B2-2b	Trip of 11 & 12 Steam Generator Feedwater Pumps
ANS B2-2c	Closure of 11 & 12 MSIVs
ANS B2-2d	Trip of All Reactor Coolant Pumps (RCPs)
ANS B2-2e	Trip of 12A RCP at 80% Power
ANS B2-2f	Main Turbine Trip at 12% Power
ANS B2-2g	Maximum Power Ramp 100% - 75% - 100% Power
ANS B2-2g	Large Break LOCA with Loss of Offsite Power
ANS B2-2i	Main Steam Line Rupture
ANS B2-2j	Slow Reactor Coolant System (RCS) Depressurization with Engineered Safety Feature Actuation System failed
ANS B2-2k	Load Rejection
ANS B2	Total Loss of All Feedwater
ANS B2-ms002	Steam Generator Tube Rupture (1.5 tubes)
ANS B2-ms004	11 MSIV Shuts

ATTACHMENT (2)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR DUAL UNIT SIMULATOR

YEAR ONE TEST PLAN

I. PROCEDURES

ANS 3.1.1 3h 100% Power to Cold Shutdown

II. MALFUNCTIONS

- 002 Wide Range Nuclear Instrumentation Channel High Voltage Power Supply Failure
- 012 Power Range Subchannel Linear Amplifier Fails High
- 016 Reactor Protective System (RPS) Channel B Bistable Trip Relay Contact Fails to Open on Trip
- 019 Failure of Manual Reactor Trip
- 027 Uncoupled CEA
- 033 Individual CEA Reed Switch Position Indication Fails
- 035 Reactor Trip
- 036 Loss of Control Element Drive Mechanism Motor Generator Set
- 048 Failure of RCP First Stage Seal
- 063 Pressurizer Pressure Safety Channel Failure
- 073 Loss of Normal Letdown Due to 1-CVC-516 Failing Closed
- 082 Failure of Boric Acid Pump
- 083 Volume Control Tank Level Transmitter Fails Hi/Lo
- 093 MSIV Stuck at 90% of Full Open
- 094 MSIV Fails Closed
- 099 Steam Generator Level Transmitter Fails Hi/Lo
- 103 Turbine Bypass Valve's Fail Open (Any Combination)
- 108 Failure of Turbine Bypass Valve Control Loop From 1PIC-4056
- 109 Turbine Bypass Valve Controller Fails in Automatic Mode
- 110 Failure of Steam Flow Transmitter Hi/Lo
- 112 Atmospheric Dump Valve Controller Fails while in Automatic Mode
- 137 Main Generator Trip
- 140 Main Generator Automatic Voltage Regulator Misoperation
- 141 Loss of Stator Liquid Cooling
- 147 Loss of Unit Two Vital Instrument Bus
- 157 Loss of Pressurizer Heater Motor Control Centers
- 160 Loss of 250 VDC Emergency DC Bus
- 161 Failure of Emergency Diesel Generator to Start
- 171 Feedwater Regulating Valve Fails Full Open or Closed in Automatic Control
- 186 Failure of Auxiliary Feedwater Actuation System to Actuate
- 191 High Pressure Safety Injection (HPSI) Valves Fail-as-is
- 195 Low Level in Safety Injection Tank
- 203 Failure of Recirculation Actuation Signal to Actuate on Automatic Demand
- 207 Failure of Containment Cooling Fans
- 214 Service Water Leak in the Auxiliary Building
- 218 Area Radiation Monitor Failure
- 223 Loss of Component Cooling Pump
- 224 Loss of Service Water Pump

ATTACHMENT (2)

**CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR
DUAL UNIT SIMULATOR**

- 225 Loss of Saltwater Pump
- 234 Loss of Motor Driven Auxiliary Feed Pump
- 239 Core Exit Thermocouple Detector Failure
- 240 Failure of MSIV to Close on Steam Generator Isolation Signal (SGIS)
- 246 Failure of Shutdown Sequence Bus 11 to Unblock
- 252 Failure of No. 12 Steam Generator Protection Level Transmitters

ATTACHMENT (2)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR DUAL UNIT SIMULATOR

YEAR TWO TEST PLAN

I. PROCEDURES

- ANS 3.1.1 3b Hot Standby to 10% Power
- ANS 3.1.1 3c Turbine Startup and Generator Synchronization
- ANS 3.1.1 3f 10% to 100% Power

II. MALFUNCTIONS

- 003 Wide Range Nuclear Instrumentation Channel Pre-amp Output Fails Low
- 008 Power Range Safety or Control Channel Detector Output Fails Low
- 011 Power Range Safety or Control Channel Output From Power Summer Fails Low
- 017 Failure of RPS Logic Matrix Relay AB-1
- 020 RPS Logic Matrix Power Supply Failure
- 028 CEAs Fail to Move on Demand (Manual)
- 029 Control Pulses Sent But CEA Doesn't Move. CEA is Trippable
- 030 Stuck CEA. Will Not Trip
- 037 Inadvertent Opening of Individual Reactor Trip Breakers
- 049 Failure of RCP Second Stage Seal
- 050 Failure of RCP Third Stage Seal
- 070 Loss of Flow From Charging Pump
- 077 Volume Control Tank Level Transmitter LT-227 Fails Hi/Lo
- 091 Steam Generator Tube Leakage
- 096 Steam Generator Level Transmitter For Protection Channels Fails Hi/Lo
- 102 Inadvertent Slow Closure of MSIV
- 103 Steam Line Rupture Outside Containment
- 107 Feed Flow Element F1111A/1121A Failure
- 115 Failure of Automatic Turbine Trips. Manual Trip Will Function
- 131 Variable High Vibration on Main Turbine
- 135 Moisture Separator Relief Valve Fails Open
- 152 Failure of Steam Generator Blowdown to Isolate on RMS Alarm
- 153 Loss of 4 kV Bus
- 154 Loss of 480 V Bus
- 155 Loss of 480 V Reactor Motor Control Center
- 163 Loss of Condenser Vacuum
- 164 Hotwell Level Control Problems
- 166 Loss of Condensate Pump
- 167 Loss of Condensate Booster Pump
- 170 Steam Generator Feed Pump Trip
- 174 Feedwater Regulating Valve Differential Pressure Transmitter Fails Hi/Low
- 180 Loss of Heater Drain Pump
- 183 Loss of Auxiliary Feedwater Pump
- 189 Failure of Low Pressure Safety Injection Pump
- 190 Failure of Containment Spray Pump
- 215 Service Water Leak in the Turbine Building
- 241 Failure of Automatic Containment Isolation Signal (CIS) Actuation

ATTACHMENT (2)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR
DUAL UNIT SIMULATOR

- 244 Spurious SGIS Actuation
- 247 Failure of Shutdown Sequence Bus 14 to Unblock

ATTACHMENT (2)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR DUAL UNIT SIMULATOR

YEAR THREE TEST PLAN

I. PROCEDURES

- ANS 3.1.1 3a Cold Shutdown to Hot Standby
ANS 3.1.1 3e Operation in Hot Standby

II. MALFUNCTIONS

- 005 Wide Range Nuclear Instrumentation Failure
- 010 Power Range Safety or Control Channel Output From Power Summer Fails High
- 018 Failure of Automatic Reactor Trip
- 021 Failure of CEA Withdrawal Interlocks to Block Outward CEA Motion
- 023 Uncontrolled Withdrawal of Individual CEA or Group of CEAs
- 025 Uncontrolled Withdrawal of a Single CEA
- 026 Uncontrolled Insertion of a Single CEA
- 032 Dropped CEA
- 038 Loop 12B Double-ended Rupture of RCS Cold Leg
- 042 Failure of Reactor Vessel Level Detector
- 043 RCP Trip
- 047 Failure of RCP Lift Pump to Reach Operating Pressure When Running
- 052 Switchyard Breaker Fails to Trip
- 054 Pressurizer Spray Valve 100E Fails Open
- 062 Pressurizer Pressure Control Fails Hi/Lo
- 064 Low Range Pressurizer Pressure Transmitters Fail Hi/Lo
- 065 Pressurizer Level Control Fails Hi/Lo
- 074 Tube Rupture in Non-Regenerative Heat Exchanger
- 075 Loss of Component Cooling to the Non-Regenerative Heat Exchanger
- 078 Failure of the Boronometer
- 079 Inadvertent Boration
- 098 Steam Generator Pressure Transmitters Fail Hi/Lo
- 104 Steam Line Rupture Inside Containment
- 106 Steam Flow Input to Digital Feedwater Control System Failure
- 113 Main Steam Safety Valve's Fail Open
- 114 Turbine Trip
- 116 Turbine Control Valve Fails Open
- 150 Loss of 13 kV Service Transformer
- 151 Loss of 13 kV Bus
- 156 Loss of a Turbine Motor Control Center
- 162 Loss of 125 Vital DC Bus
- 165 Gross Condenser Tube Leakage
- 172 Feedwater Regulating Valve Mechanical Failure
- 177 Feed Line Rupture Outside of the Containment
- 185 Auxiliary Feedwater Pipe Rupture
- 188 Failure of HPSI Pump
- 204 Failure of the Diverse Scram System to open
- 217 Saltwater System Leak

ATTACHMENT (2)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR DUAL UNIT SIMULATOR

- 219 High Radiation Alarms on Process Radiation Monitors
- 221 Intake Structure Traveling Screens Obstructed
- 226 Loss of Service Water to Turbine Building
- 242 Failure of Manual CIS Actuation
- 248 Failure of **LOCIS** Bus 11 to Unblock
- 250 Steam Generator Wide Range Level Transmitters Fail

ATTACHMENT (2)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR DUAL UNIT SIMULATOR

YEAR FOUR TEST PLAN

I. PROCEDURES

ANS 3.1.1 3j 100% Power Reactor Trip and Recovery to 100% Power

II. MALFUNCTIONS

004 Wide Range Nuclear Instrumentation Channel Startup Rate Degradation
024 Uncontrolled Insertion of Individual CEA or Group of CEAs
031 Stuck CEA. Will Trip
034 Rupture of Control Element Drive Mechanism Housing (CEA #1)
039 RCS Leak into Containment
045 Locked Rotor on RCP 11B
060 Power-Operated Relief Valve (PORV) Minor Leakage
061 Pressurizer Safety Valve Leakage
066 Major Leakage of PORVs (Previously Malfunction 59)
068 Leak in Letdown Line Inside Containment (Between Check Valve & 1-TE-221)
069 Leak in Letdown Line in Penetration Room
086 Leakage Through Letdown Line Relief Valves
087 Charging Pump Primary Packing Leak
092 Steam Generator Gross Tube Failure
097 Digital Feedwater Control System Central Processing Unit Failure
100 Steam Generator Differential Pressure Transmitter Fails Hi/Lo
138 Load Rejection
149 Loss of Off-site Power
158 Loss of Non-Vital 120/208 VAC Instrument Bus
159 Loss of 120 VAC Vital Instrument Bus
173 Erratic Operation of Feedwater Regulating Valve
175 Feedwater Line Rupture Inside the Containment; Before Check Valve
176 Feedwater Line Rupture Inside the Containment; After Check Valve
181 Feedwater Flow Transmitter Input to Control Channel Fails
187 Low Pressure Safety Injection Pump Suction Break
196 Failure of Safety Injection Actuation Signal to Actuate on Automatic Demand
197 Failure of Safety Injection Actuation Signal Manual Initiation
199 Failure of Containment Spray Actuation Signal to Actuate on Automatic Demand
200 Failure of Containment Spray Actuation Signal Manual Initiation
205 Spurious CIS
213 Failed Fuel Equivalent to 1 Fuel Pin
216 Accidental Release of Gaseous Waste
227 Loss of Instrument Air
228 Loss of Instrument Air in Containment
231 Component Cooling Water Leak in Containment
233 Loss of Component Cooling Water to Containment
238 Core Exit Thermocouple Meter Failure
243 Failure of Automatic SGIS Actuation
245 Containment Radiation Monitor Failure

ATTACHMENT (2)

CALVERT CLIFFS UNIT ONE -- REFERENCE PLANT SIMULATOR
DUAL UNIT SIMULATOR

- 249 Failure of **LOCIS** Bus 14 to Unblock
- 251 Failure of No. 12 Steam Generator Pressure Transmitters
- 253 Blockage of Saltwater Components