

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

November 12, 1996

Director, Office Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Serial No. 96-540
NL&OS/ETS
Docket Nos. 50-280
50-281
License Nos. DPR-32
DPR-37

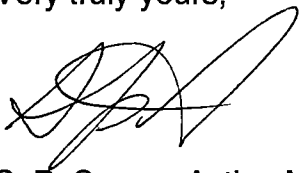
Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
SIMULATOR CERTIFICATION FOUR-YEAR REPORTS

Pursuant to 10 CFR 55.45(b)(5)(ii), we are submitting the Simulator Facility Certification Four Year Report for Surry Units 1 and 2. The intent of these reports is to document our continuing compliance with ANSI/ANS-3.5-1985, as modified or endorsed by Regulatory Guide 1.149, dated April 1987. The reports are included as attachments to this letter.

If you have any questions, or require additional information please contact Dr. A. H. Friedman, Manager Nuclear Training at (804) 273-2701.

Very truly yours,



S. P. Sarver, Acting Manager
Nuclear Licensing and Operations Support

Attachments

9611200260 961112
PDR ADOCK 05000280
P PDR

200117

ADD 5 1/1

cc: Mr. T. A. Peebles
Chief, Division of Reactor Safety - Operations Branch
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, Georgia 30323

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Mr. R. A. Musser
NRC Senior Resident Inspector
Surry Power Station

SURRY UNIT 1
SIMULATOR CERTIFICATION
2nd FOUR YEAR REPORT
(1992 - 1996)

**SURRY UNIT 1
SIMULATOR CERTIFICATION FOUR YEAR REPORT**

This Surry Simulator Certification Four Year Report (1992 - 1996) consists of the following sections:

- Previous Four Year Simulator Test Results Summary (Attachment 1)
- 1997 - 2000 Simulator Test Schedule (Attachment 2)
- Simulator Fidelity & Upgrade Report (Attachment 3)

ATTACHMENT 1
PREVIOUS FOUR YEAR SIMULATOR TEST RESULTS SUMMARY

Since October 1992, a number of modifications have been made to the Surry simulator. Testing, which verified simulator fidelity acceptable for training and certification, has been completed. Discrepancies that are identified during the report period are resolved in a timely manner in accordance with training administrative procedures.

The Integrated Tests for the Unit Cooldown for Hot Shutdown to Intermediate Shutdown and Unit Cooldown for Intermediate Shutdown to Cold Shutdown were performed in the first year of this cycle, 1992, instead of the fourth year as scheduled. The Integrated Tests for the Unit Heatup from Cold Shutdown to Intermediate Shutdown and Heatup from Intermediate Shutdown to Hot Shutdown were performed in the fourth year of this cycle, 1996, instead of the first year as scheduled. All testing was satisfactorily completed within the four-year time frame specified.

Based upon the testing conducted, and their results, the Surry simulator is acceptable for licensed operator training and retraining.

MALFUNCTION MODIFICATIONS

The following malfunctions were modified to meet changing training requirements.

MMI03

GRADUAL INCREASE IN CONTAINMENT PRESSURE

Modification to instructor console program required the deletion of the "MI" System designation for all instructor console malfunctions and overrides. Therefore MMI03, Gradual Increase In Containment Pressure, was renamed to MRS11, Gradual Increase In Containment Pressure. No modeling changes were made as a result of this action.

MMI04

FAILURE OF REACTOR TRIP BUTTON

Modification to instructor console program required the deletion of the "MI" System designation for all instructor console malfunctions and overrides. Therefore MMI04, Failure Of Reactor Trip Button, was renamed to MRD21, Failure Of Reactor Trip Button. No modeling changes were made as a result of this action.

ATTACHMENT 2
1997 - 2000 SIMULATOR TEST SCHEDULE

The next four year simulator test schedule follows. The tests are divided in such a manner as to ensure that 25% are performed each year thereby ensuring that all testing is completed within the four year time frame specified.

SIMULATOR PERFORMANCE TEST SCHEDULE

The performance testing to be conducted over the next four years will consist of the following.

- The Steady State Tests of ANS-3.5-1985 Appendix B section B.2.1 will be conducted annually.
- The Transient Performance Tests of ANS-3.5-1985 Appendix B section B.2.2 will be conducted annually.

November 1996 - October 1997

Integrated Tests

- Plant Heatup from Cold Shutdown to Intermediate Shutdown.
- Plant Heatup from Intermediate Shutdown to Hot Shutdown.

Malfunction Tests

MCA01	INSTRUMENT AIR LEAK
MCA02	CONTAINMENT INSTRUMENT AIR COMPRESSOR IA-C-4A,B TRIP
MCA04	CONTAINMENT INSTRUMENT AIR HEADER LEAK
MCA08	INSTRUMENT AIR COMPRESSOR OVERLOAD TRIP
MCC01	LOSS OF CC WATER TO SW THROUGH CC HX'S
MCC03	OVERLOAD TRIP OF COMPONENT COOLING WATER PUMP
MCC04	LOSS OF COMPONENT COOLING TO NON-REGENERATIVE HEAT EXCHANGER
MCC05	THERMAL BARRIER LEAK TO CC SYSTEM
MCH01	ISOLABLE LETDOWN LINE LEAK IN CONTAINMENT
MCH02	ISOLABLE LETDOWN LINE OUTSIDE CONTAINMENT

MCH03 CHARGING LINE LEAK DOWNSTREAM FCV-1122 OUTSIDE
CONTAINMENT
MCH05 LOSS OF CHARGING PUMP
MCH06 NON-REGENERATIVE HEAT EXCHANGER TEMPERATURE
CONTROLLER TC-1144B FAILS
MCH11 RCP SEAL WATER INJECTION PRESSURE TRANSMITTER FAILURE
MCH12 RCP SEAL WATER RETURN HEADER TEMPERATURE TRANSMITTER
FAILURE
MCH13 TUBE RUPTURE IN THE NON-REGENERATIVE HEAT EXCHANGER
MCH17 SEAL WATER RETURN FILTER CLOGS
MCH19 VCT LEVEL CONTROLLER FAILURE
MCH20 FUEL MELT
MCH21 VCT LEVEL TRANSMITTER FAILURE
MCH22 VOLUME CONTROL TANK PRESSURE TRANSMITTER FAILURE
MCH23 VOLUME CONTROL TANK TEMPERATURE TRANSMITTER FAILURE
MCH24 BORIC ACID FLOW CONTROLLER 1113 FAILURE
MCH25 PRIMARY WATER FLOW CONTROLLER 1114 FAILURE
MCH28 FAILURE OF CHARGING FLOW CONTROLLER
MCH29 FAILURE OF CHARGING FLOW TRANSMITTER
MCH31 REGENERATIVE HEAT EXCHANGER OUTLET TEMPERATURE
TRANSMITTER CH-TE-1123
MCH35 LOW PRESSURE LETDOWN FLOW TRANSMITTER FAILURE
MCH36 LETDOWN PRESSURE CONTROLLER (PC-1145) FAILURE
MCH37 LOW PRESSURE LETDOWN LINE PRESSURE TRANSMITTER PT-1145
FAILURE
MCH38 REGENERATIVE HEAT EXCHANGER LETDOWN TEMPERATURE
TRANSMITTER FAILURE
MCH39 LETDOWN LINE RELIEF LINE TEMPERATURE TRANSMITTER
FAILURE
MCH40 LOW PRESSURE LETDOWN LINE TEMPERATURE TRANSMITTER
FAILURE
MCH41 NON-REGENERATIVE HEAT EXCHANGER OUTLET TEMPERATURE
TRANSMITTER FAILURE
MCN01 LOSS OF CONDENSATE PUMP, OVER CURRENT
MCN02 AIR LEAK INTO MAIN CONDENSER CN-SC-1A & 1B BOOT
MCN03 HOTWELL LEVEL CONTROLLER FAILURE LC-CN-102
MCN05 CONDENSATE LINE LEAK BETWEEN CN_114 AND FCV-CN-107
MCN08 LOSS OF AIR EJECTOR LOOP SEAL
MEL01 LOSS OF ALL OFFSITE POWER
MEL02 MAIN GENERATOR TRIP

November 1997 - October 1998

Integrated Tests

- Unit start up operations (Hot Shutdown to Full Power).

Malfunction Tests

MEL07	LOSS OF 4160V STATION BUS
MEL08	LOSS OF SCREENWELL TRANSFORMER
MEL09	LOSS OF EMERGENCY DIESEL GENERATOR
MEL12	LOSS OF 480V EMERGENCY SWITCHGEAR
MEL13	LOSS OF 480V EMERGENCY MOTOR CONTROL CENTER
MEL14	LOSS OF SEMI-VITAL BUS
MEL17	LOSS OF 125V D.C. BUS
MEL18	LOSS OF 480V STATION SWITCHGEAR
MEL19	LOSS OF 480V MOTOR CONTROL CENTER
MEL20	LOSS OF AC VITAL BUS
MEL21	LOSS OF 4160V EMERGENCY BUS
MFW01	MAIN FEEDWATER PUMP RECIRC VALVE FAILS OPEN
MFW02	MAIN FEEDWATER REGULATING VALVE FAILS CLOSED
MFW04	MAIN FEED PUMP LOW LUBE OIL PRESSURE
MFW05	MAIN FEEDWATER BREAK BETWEEN FLOW TRANSMITTER AND DISCHARGE CHECK VALVE
MFW07	AUX FEED PUMPS FW-P-3A/B TRIP : OVERCURRENT
MFW08	AUX FEED PUMP TURBINE WON'T STOP
MFW10	AUXILIARY FEED PUMP CHECK VALVE OPEN
MFW12	MAIN FEED PUMP SUCTION LINE BREAK
MFW13	STEAM GENERATOR LEVEL TRANSMITTER FAILURE (0-100%)
MFW14	AUXILIARY FEEDWATER BREAK DOWNSTREAM OF FLOW TRANSMITTER AND CHECK VALVE
MFW15	MAIN FEEDWATER BREAK DOWNSTREAM OF CHECK VALVE OUTSIDE CONTAINMENT
MFW16	MAIN FEEDWATER BREAK IN CONTAINMENT
MFW17	DEGRADATION OF MAIN FEED PUMP
MFW18	STEAM GEN MAIN FEED FLOW TRANSMITTER FAILURE
MFW19	STEAM GEN MAIN FEED FLOW CONTROLLER FAILURE
MFW20	STEAM GEN WIDE RANGE LEVEL TRANSMITTER FAILURE
MFW21	STEAM GEN AUX FEED FLOW TRANSMITTER FAILURE
MFW22	STEAM GEN MAIN FEED HEADER PRESSURE TRANSMITTER FAILURE
MFW23	TOTAL LOSS OF FEEDWATER
MMS01	RUPTURE OF MAIN STEAM LINE AT HEADER
MMS03	RUPTURE OF MAIN STEAM LINE UPSTREAM OF FLOW ELEMENT
MMS04	RUPTURE OF MAIN STEAM LINE BEFORE THE TRIP VALVE
MMS06	MAIN STEAM TRIP VALVE FAILS AS IS
MMS07	MAIN STEAM SAFETY VALVE FAILS OPEN

MMS08 STEAM GEN STEAM FLOW TRANSMITTER FAILURE
MMS09 MAIN STEAM TRIP VALVE FAILS SHUT
MMS10 FAILURE OF AUTO STEAM DUMP AS IS
MMS11 MAIN STEAM HEADER PRESSURE TRANSMITTER FAILURE
MMS13 STEAM GEN PRESSURE TRANSMITTER FAILURE
MMS14 TURBINE FIRST STAGE PRESSURE TRANSMITTER FAILURE

November 1998 - October 1999

Integrated Tests

- Decreasing power from 100% power level to Hot Shutdown conditions.
- Computer Real Time Test.

Malfunction Tests

MMS15 SG PORV CONTROLLER FAILURE
MNI01 SOURCE RANGE CHANNEL FAILURE
MNI02 SOURCE RANGE DETECTOR FAILURE (DISCRIMINATOR ERROR)
MNI03 INTERMEDIATE RANGE CHANNEL UNDERCOMPENSATION
MNI04 INTERMEDIATE RANGE CHANNEL OVERCOMPENSATION
MNI05 INTERMEDIATE RANGE CHANNEL FAILURE
MNI06 FAILURE OF IR TO ALLOW SR BLOCK
MNI07 LOSS OF INSTRUMENT POWER TO POWER RANGE CHANNEL
MNI08 POWER RANGE CHANNEL UPPER DETECTOR FAILURE
MNI09 POWER RANGE CHANNEL LOWER DETECTOR FAILURE
MNI10 POWER RANGE CHANNEL FAILS
MRC01 REACTOR COOLANT SYSTEM COLD LEG PIPE RUPTURE
MRC02 REACTOR COOLANT SYSTEM HOT LEG PIPE RUPTURE
MRC03 REACTOR COOLANT SYSTEM SUCTION LEG PIPE RUPTURE
MRC04 REACTOR COOLANT SYSTEM NONISOLABLE LEAK
MRC05 RCP OVERCURRENT TRIP
MRC07 FAILURE OF NARROW RANGE T-HOT INSTRUMENT / RTD
MRC08 TAYLOR MATH UNIT FAILURE HI/LO
MRC11 FAILURE OF NARROW RANGE T-COLD INSTRUMENT / RTD
MRC14 FAILURE OF RCP SEAL #3
MRC15 PRZR PRESSURE CONTROLLERS FAILURE
MRC16 PRZR REL/SFTY VV LINE TEMPERATURE TRANSMITTER FAILURE
MRC17 PRESSURIZER LEVEL CONTROL FAILURE
MRC20 BOTH PRZR SPRAY VALVES FAIL SHUT
MRC21 PRESSURIZER SAFETY VALVE FAILS OPEN
MRC22 PRZR SPRAY VALVE FAILS OPEN
MRC24 STEAM GENERATOR TUBE RUPTURE
MRC25 PRESSURIZER HEATERS GROUP FAIL ON

MRC26	RCP SHAFT SHEARS
MRC30	LOSS OF SEAL INJECTION FLOW TO RCP
MRC31	REACTOR COOLANT LOOP FLOW TRANSMITTER FAILURE
MRC34	RCS WIDE AND NARROW RANGE PRESSURE TRANSMITTER FAILURE
MRC37	PRESSURIZER RELIEF TANK PRESSURE TRANSMITTER FAILURE
MRC38	LOSS OF COMPONENT COOLING WATER TO RCP
MRC40	PRESSURIZER PORV LEAKAGE
MRC42	PRESSURIZER TEMPERATURE TRANSMITTER FAILURE
MRC45	PRESSURIZER RELIEF TANK TEMPERATURE TRANSMITTER FAILURE
MRC46	REACTOR VESSEL LEAKOFF TEMPERATURE TRANSMITTER FAILURE
MRC48	PRESSURIZER PRESSURE TRANSMITTER FAILURE
MRC49	PRESSURIZER LEVEL TRANSMITTER FAILURE
MRC50	PRESSURIZER RELIEF TANK LEVEL TRANSMITTER FAILURE

November 1999 - October 2000

Integrated Tests

- Unit cooldown from Hot Shutdown to Intermediate Shutdown.
- Unit cooldown from Intermediate Shutdown to Cold Shutdown.

Malfunction Tests

MRD01	CONTINUOUS ROD WITHDRAWAL, MANUAL OR AUTO
MRD02	CONTINUOUS ROD INSERTION MANUAL OR AUTO
MRD03	LOGIC FAILURE CAUSING TWO BANKS TO MOVE AT THE SAME TIME
MRD04	AUTO AND MANUAL ROD CONTROL INOPERABLE
MRD05	CONTROL BANKS IN SPEED FAIL TO 72 SPM
MRD06	CONTROL BANKS IN SPEED FAIL TO 8 SPM
MRD07	CONTROL BANKS OUT SPEED FAIL TO 72 SPM
MRD08	CONTROL BANKS OUT SPEED FAIL TO 8 SPM
MRD09	CONTROL BANK MOVES OUT WHEN IN DEMANDED IN AUTO
MRD10	CONTROL BANK MOVES IN WHEN OUT DEMANDED IN AUTO
MRD12	DROPPED CONTROL ROD
MRD13	EJECTED CONTROL ROD
MRD15	REACTOR TRIP BREAKERS OPEN DUE TO UV COIL FAILURE
MRD16	INDIVIDUAL ROD POSITION INDICATION FAIL
MRD18	FAIL OF AUTO TRIP TO SCRAM RX
MRD19	FAILURE OF ALL ROD STOPS TO BLOCK ROD MOVEMENT
MRD20	STUCK ROD

MRD21 FAILURE OF REACTOR TRIP BUTTON
MRH01 RESIDUAL HEAT REMOVAL SYSTEM LEAK
MRH02 LOSS OF RESIDUAL HEAT REMOVAL PUMP
MRH04 HCV-1758 CONTROLLER OUTPUT FAILURE
MRH05 RHR FLOW CONTROLLER FC-1605 FAILS
MRH06 RELIEF VALVE FAILS OPEN ON RESIDUAL HEAT
REMOVAL SYSTEM
MRM01 AREA RADIATION MONITOR FAILS
MRM02 PROCESS RADIATION MONITOR FAILURE
MRS06 LOSS OF OUTSIDE RECIRC SPRAY PUMP
MRS07 LOSS OF INSIDE RECIRC SPRAY PUMP
MRS08 LOSS OF CONTAINMENT SPRAY PUMP
MRS11 GRADUAL INCREASE IN CONTAINMENT PRESSURE
MSI03 SAFETY INJECTION HOT LEG FLOW TRANSMITTER FAILURE
MSI04 SAFETY INJECTION TOTAL FLOW TRANSMITTER FAILURE
MSI05 LHSI PUMP FLOW TRANSMITTER FAILURE
MSI06 SAFETY INJECTION COLD LEG FLOW TRANSMITTER FAILURE
MSI07 SAFETY INJECTION ACCUMULATOR TRANSMITTER FAILURE
MSI08 FAILURE OF SAFETY INJECTION RESET TIMER
MSI10 LOW HEAD SAFETY INJECTION PUMP IMPELLER DEGRADATION
MTU01 TURBINE TRIP DUE TO SOLENOID FAILURE
MTU04 FAILURE OF MANUAL TURBINE TRIP
MTU13 FAILURE OF AUTOMATIC TURBINE RUNBACK
MWD01 DROPPED SPENT FUEL ASSEMBLY IN THE SPENT FUEL PIT
MWD03 ACCIDENTAL RELEASE OF RADIOACTIVE GAS

ATTACHMENT 3
SIMULATOR FIDELITY & UPGRADE REPORT

PHYSICAL FIDELITY

Physical fidelity is verified with an item-by-item comparison of the Simulator Control Room to a series of Unit 1 Plant Control Room photographs that are taken annually. Identified discrepancies are scheduled for resolution during the current year.

The report includes identification of all unresolved Simulator Control Panel discrepancies and indicates the work to be performed based on training impact, cost effectiveness, and other considerations as appropriate. Also included are discrepancies identified as requiring no action. Generic Control Room/Panel differences have been identified as necessary.

The simulator Physical Fidelity Report is not included with this report; however, it is available for examination.

CONTROL ROOM AND SIMULATOR PANEL COMPARISON

A review was conducted of the original and the first four-year submittal reports on the Surry Control Room and Simulator Comparison of Panel Layout. The review was performed to update the changes made during the prior four years and to validate the original differences noted. This comparison also identifies any differences between Unit 1 and Unit 2 Control Room Panels.

The review of the Control Room and Simulator Panel Comparison is not included with this report; however, it is available for examination.

Panels that remain non-simulated because of their relative minor training value are:

ROBERTSHAW FIRE PROTECTION PANEL
STATION FIRE PROTECTION PANEL
FLOOD CONTROL PANEL (Hardware only installed)

CONTROL ROOM AND SIMULATOR ENVIRONMENTAL REVIEW

The following minor environmental differences identified in the original and the first four year simulator certification report have been incorporated into the simulator:

Simulator Gaitronics system has been modified to mute the paging feature from the control room.

The remaining environmental differences identified in the initial and the first four year simulator certification reports have been reviewed and found to have no impact on training. Based upon the review results, the simulator is acceptable for operator training and retraining.

OTHER SIMULATOR UPGRADES INSTALLED

- The simulator *Electronic Associates Inc.* hardware I/O system was replaced and upgraded to a VMIC "Intelligent I/O Control" system.
- The simulator computer hardware configuration was upgraded from a Gould 32/8780 to a SUN SPARC 10 workstation. The simulation software was then recompiled to run on the new UNIX platform. Extensive testing was conducted to ensure model integrity and functionality of all simulator features.
- Reactor core cycles upgrades 13, and 14 were installed upon completion of the respective station refueling cycle.
- A Simulator model modification was installed during the normal Design Change process for DCP-94-30-3, Core Uprate Setpoint Change. This change increased the core operating power level to 2546 MWt. This Design Change also modified the RWST, Hi Steam Flow, SI Pressurizer Pressure Low, Tave and Delta T setpoints. Modification was also performed to the Steam Dump, Rod Speed, Pressurizer Level, Turbine First Stage, and EHC System control and equipment protection functions.
- A Simulator model modification was installed during the normal Design Change process for DCP-92-028, Radiation Monitor Ratemeter and Recorder Replacement. This design change is still in progress; however, the portion which was completed replaced the Radiation Monitor Alarm Panel in its entirety.
- The simulator's audio and video recording capability was enhanced by the addition of upgraded microphones and cameras.

SIMULATOR DISCREPANCIES IDENTIFIED
DURING NRC EXAMINATIONS.

The following simulator discrepancies were identified during NRC inspections from September, 1993 to September, 1996.

<u>SMR No.</u>	<u>DESCRIPTION</u>
9301281000	The simulator did not adequately model RHR mid-loop operation/evolutions. RHR model upgrade completed on 03-14-94
9411290805	During Reactor Coolant System (RCS) cooldown, RCS pressure suddenly and unexpectedly decreased. Repair completed on 04-18-95
9412281237	Simulator label plate for 2-VS-HF-4 incorrectly reads 2-VS-F-4. Label replaced on 03-23-95

SURRY UNIT 2
SIMULATOR CERTIFICATION
2nd FOUR YEAR REPORT
(1992 - 1996)

**SURRY UNIT 2
SIMULATOR CERTIFICATION FOUR YEAR REPORT**

The Surry Power Station is a two unit station, operating from a common control room. The respective unit control panels are identical in their configuration and layout with respect to the operator. A few auxiliary systems panels present a mirror image layout to the operator in order to maintain an overall balanced appearance of the control room.

This Surry Unit 2 Simulator Certification Four Year Report consist of the following sections:

- Simulator Fidelity & Upgrade Report (Attachment 1)

There were no significant differences identified during the previous four years. The Surry Unit 1 Simulator meets the Unit 2 training needs.

**ATTACHMENT 1
SIMULATOR FIDELITY & UPGRADE REPORT**

PHYSICAL FIDELITY

A review was conducted of the original and the first four-year submittal reports on the Surry Unit 2 Control Room and Simulator Panel Comparison. The review was performed to update the changes made during the prior four years and to validate the original differences noted. This comparison also identifies any differences between Unit 1 and Unit 2 Control Room Panels.

The review of the Control Room and Simulator Panel Comparison is not included with this report; however, it is available for examination.

Panels specific to Unit 2 operation that remain non-simulated because of their relative minor training value are:

VICTOREEN RADIATION MONITORING
INCORE FLUX DISTRIBUTION PANEL
NUCLEAR INSTRUMENTATION PANEL
CONTAINMENT HIGH RANGE RADIATION MONITORING PANEL
EMERGENCY DIESEL GENERATOR #2 PANEL
EMERGENCY DIESEL GENERATOR #3 PANEL (UNIT 2 SIDE)
TURBINE SUPERVISORY PANEL
REACTOR COOLANT PUMP VIBRATION PANEL
SECONDARY CHEMISTRY MONITORING PANEL
VERTICAL BOARD #1
VERTICAL BOARD #2
POST ACCIDENT MONITORING PANEL
BENCHBOARD #1
BENCHBOARD #2
PLANT COMPUTER P-250 OPERATOR STATION
RADIATION MONITORING PANELS

ENVIRONMENTAL REVIEW

Environmental differences between the simulator and the Unit 1 Control Room are discussed within the Surry Unit 1 Simulator Certification Four Year Report.