O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS01
14. 6.20. 4.00

TITLE: Recirc Loop Rupture (Unisolable)

PREPARED BY/DATE: John Edalmura / 11/21/00

APPROVED BY/DATE: Adam H Moog / 11/29/00

TEST DATE: 11/16/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF1	3.1.2(1)(b)	LOCA inside & outside containment
MF2	3.1.2(1)(c)	Large & small reactor coolant breaks, including demonstration of saturated conditions

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Piping failure.

The selected recirc loop suction line will rupture with the break size as selected by the instructor. The rupture is unisolable. Maximum flow area of 671 square inches.

With the malfunction activated to the maximum leak size, the reactor water level will decrease to below the core and the drywell pressure and temperature will increase as indicated by the various instruments in the control room. The LOCA will cause many control room panel annunciators to alarm. The primary ones are identified in the test procedure. Automatic actions are extensive, including:

- Automatic Depressurization (ADS) - Depending on Leak severity
- Core Spray initiation.
- Containment Spray initiation.
- MSIV closure
- Reactor isolation
- Containment isolation
- Reactor Scram
- ARI initiation
- Isolation Condenser initiation

SAR data was printed for this test.

The Following Data was recorded on the Trend recorders:

T:PIP08	Drywell pressure (Hi Range 0-75psig)
T:TPCNDVB	Drywell temperature
T:PIP12	Torus pressure
T:TI43A	Torus Bulk temperature
LNSSMPB	Rx level (FZ)
T:PIA92A	Rx pressure
T:LT37	Torus level
T:RI790	Containment radiation (CHRMS)
T:LIA12	Rx level (Wide Range)
SNISAPRM	Rx Power
T:FFID75	Total feedwater flow
T:LT15	Hotwell level (LT-15)
T:LI35	Condensate storage tank level
T:F27A	Core spray system 1 flow
T:F27B	Core spray system 2 flow
ZPCNDRH	Drywell humidity
T:TE451	GEMAC Level ref. leg temp
RRTCLDMX	Max fuel clad temperature
T:FID33A	Main steam line A flow
T:FID33B	Main steam line B flow
T:RN06A,B,C,D	Main steam line radiation
RRWBREA(1)	Flow rate from break
T:R1625	Stack Gas Radiation
PTBSNSS	Turbine Building pressure
T:TTRNM	Trunion room temperature
T:XHA223	Containment H2 Level

Results:

Numerous field changes were made to the procedure to correct monitored variables.

The procedure anticipates that the Lo Lo Lo Level switches will activate initiating Automatic Depressurization (ADS). During this test, the Lo Lo Lo Level switches did actuate. When this malfunction is activated at 200%, the reactor depressurizes very rapidly allowing Core Spray Injection. The responses were judged to be correct.

Both Isolation Condensers Initiated from the Lo Lo Water Level Signal, then isolated from a high flow signal.

All alarms and automatic actions identified in the procedure actuated as expected.

The procedure includes a mass and energy balance. The mass section of the procedure was attempted. Numerous changes to the variables for mass and energy. Those variables identified in the test procedure were invalid. Results of the mass balance were inconclusive because the reactor appears to be "chugging" causing flows to vary too widely to be used in calculations. Data for an energy balance is insufficient.

The Primary Containment response differed markedly from the response described in the procedure. The Drywell and Torus temperatures increased during the test because Containment and Torus spray systems are now manually initiated systems. The test procedure expects these sprays to have initiated.
The reviewer considers the response acceptable.

The overall response of the simulator was excellent in terms of temperature response, alarms, and safety system actuation's.

AVAILABLE OPTIONS:

(1) Loop to fail	NSS-4A	Loop A
	NSS-4B	Loop B
	NSS-4C	Loop C
	NSS-4D	Loop D
	NSS-4E	Loop E
(2) Rupture size	0-200% (100% = 671 sq. in)	
	200% = Double Ended shear	
(3) Ramp time	0-14,400 seconds	

(4) Delay time 0-28,800 seconds

OPTIONS TESTED:

(1) NSS-4D Recirc loop D suction side rupture (unisolable)

(2) Leak size 200% Double ended shear

(3) Ramp time 0 seconds

(4) Delay time 0 seconds

A check of the same malfunction for the other 4 Recirc Loops is performed without collecting data or verifying the detailed response.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

Place H2O2 Monitors in service.

Establish a monitored variable file for mass and energy calculations.

FINAL TEST CONDITIONS:

Run Time: 45 Minutes

Near the conclusion of this test, the plant is in a post-accident condition with core spray pumping from the torus to the reactor and leaking back to the torus. The simulator is capable of continued recovery events. The Emergency Operating procedures would eventually lead to Containment Flooding, a condition beyond the scope of this test.

At the end of the test, all injection of water into the reactor (Core Spray, Feedwater, CRD) has been terminated and fuel failure has occurred as indicated by increasing Hydrogen Concentration in the Drywell. (See Trend Charts)

The malfunction is not recoverable, requiring the IC to be reset to clear the pipe break.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

Technical Data Report TDR No. 716, Best-Estimate Analysis of OC DBA LOCA Containment Response, Rev. 3 was used in preparing the procedure.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS02
14.6.20.11

TITLE: Reactor Vessel Instrument Reference Leg Rupture

PREPARED BY/DATE: E May / 7/29/99

TEST DATE: 07/29/1999

APPROVED BY/DATE: R Davidson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF1	3.1.2(1)(b)	LOCA inside & outside containment
MF2	3.1.2(1)(c)	Large & small reactor coolant breaks, including demonstration of saturated conditions
MF13	3.1.2(11)	Loss of protective system channel
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Reference leg rupture.

The selected reference leg will rupture inside containment.

Level transmitters and switches will fail high. Pressure transmitters and switches will fail low.

		LT	PT	LS	PS
NSS11A	Ref				
Leg from	RE08A	RE02A			
		RE02B			
		RE05A			
		RE05/19A			

NSS11B	Ref	RE02C			
Leg from	RE08B	RE02D			
		RE05B			
		RE05/19B			
NS11C	Ref	ID13A	622-1020	RE18A	IA83E
Leg from	IA15A		622-1008	RE18C	
			622-1009		
			622-1018		
			IA90A		
			IA901A		
			IA92A		
NSS11D	Ref	ID13B	RE03C	RE18B	RE16B
Leg from	IA15B		RE03D	RE18D	RE17B
			RE15C		RE17D
			RE15D		IA83C
			ID45		IA83D
			IA90B		
			622-1010		
			IA91B		
			622-1011		
			IA92B		
			622-1019		
				ID13C	

The following data was recorded on the 8 pen recorders:

T:FID33A T:FID33B	Total steam flow
TT:FFID75	Feedwater flow
T:LRE21A T:LRE21B	Rx water level

T:TE451 T:TE450	Reference leg temp element (TE-130-451)
T:T102A	Drywell temperatures

The Sequence of Alarms Recorder (SAR) Printouts were also attached.

Results:

All alarms and automatic actions identified in the procedure occurred as expected. Several SAR Alarms were found to be incorrect. All other alarms and automatic actions occurred as expected.

AVAILABLE OPTIONS:

(1) Reference leg to fail	NSS-11A Ref leg from RE08A NSS-11B Ref leg from RE08B NSS-11C Ref leg from IA15A NSS-11D Ref leg from IA15B
NSS-11E RPS A Side	
(2) Ramp time	0-14,400 seconds
(3) Delay time	0-28,800 seconds

OPTIONS TESTED:

A. (1) NSS-11D Reference leg rupture
(2) Ramp time 30 seconds
(3) Delay time 0 seconds
(4) Severity = 100%

B. (1) NSS-11A Reference leg RE08A fails
(2) Ramp time 0 seconds
(3) Delay time 0 seconds
(4) Severity = 100%

C. (1) NSS-11B Reference leg RE08B fails
(2) Ramp time 0 seconds
(3) Delay time 0 seconds
(4) Severity = 100%

D. (1) NSS-11C Reference leg IA15A fails
   (2) Ramp time 30 seconds
   (3) Delay time 0 seconds
   (4) Severity = 100%

INITIAL CONDITIONS FOR TEST:

(1) IC-65, power operation
(2) Select B Level for Feedwater Control for NSS11D
(3) Select A Level for Feedwater control for NSS11C

FINAL TEST CONDITIONS:

Run Time: 3 Hours

At the conclusion of this test, the plant has scrammed and isolated from an instrument line rupture. The rupture is not recoverable, requiring IC reset to continue normal operations. The simulator however, is capable of continued simulation of the recovery operations if desired.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS03
14.6.20.16

TITLE: Reactor Safety Valve Fails open

PREPARED BY/DATE: [signature] / 8/2/99

TEST DATE: 07/29/1999

APPROVED BY/DATE: R Davidson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF1 3.1.2(1)(b) LOCA inside & outside containment

MF3 3.1.1(2)(d) Failure of safety and relief valves (LOCA)

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Safety valve setpoint spring failure

Primary Effects:
The selected safety valve opens.

With malfunction NSS-16A activated, the SV/EMRV NOT CLOSED annunciator on panel 1F/2F alarms, drywell pressure increases and turbine load decreases. The reactor scrams due to high drywell pressure.

The following data was recorded on the 8 pen recorders:

T:XAPRM1	RX power, APRM 1
T:XAPRM6	RX power, APRM 6
T:PT53	Drywell pressure
T:T102A	Drywell temperature
T:T101B	" "
T:PTID45	Rx pressure
T:LID59A	Rx level
T:FID38A	Steam Flow
T:FID38B	" "
T:FFID75	Feedwater flow
T:RI790	Containment radiation
T:XNR28H1	Safety valve (NR28H)
T:XNR28H1	Safety Valve (NR28H)

The Sequence of Alarms Recorder (SAR) printout was attached.

Results:

All automatic actions occurred and all alarms identified in the procedure were received. Many additional alarms caused by the reactor scram, turbine trip and reactor isolation were also received. These additional alarms are appropriate.

Some alarms were missing on the SAR printout. TR 3699 was previously written to correct this.

AVAILABLE OPTIONS:

(1) Valve to fail open	NSS-16A NR28D	NSS-16B NR28E
	NSS-16C NR28F	NSS-16D NR28G
	NSS-16E NR28H	NSS-16F NR28J
	NSS-16G NR28K	NSS-16H NR28L
	NSS-16I NR28M	
(2) Delay time	0-28,800 seconds	

OPTIONS TESTED:

(1) NSS-16E Reactor safety valve NRNR28H fails open

(2) Delay time 0 seconds

The test was repeated in a brief manner for the remaining 8 safety valves. No data was recorded for these additional tests.

INITIAL CONDITIONS FOR TEST:

IC-65, 100% power operation.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the reactor has scrammed, and the reactor & containment have isolated. Although the malfunction is recoverable, no attempt was made to clear the malfunction and perform a recovery.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS04
14.6.2.1

TITLE: Loss of Instrument Air

PREPARED BY/DATE: [signature] / 11/12/97

TEST DATE: 10/29/97

APPROVED BY/DATE: R Davidson / 12/6/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF4	3.1.2(2)	Loss of instrument air to whole system or individual headers

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Weld failure

With the malfunction activated to 100% the instrument air pressure indication on panel 7F decreases. The following annunciators on 7F alarm:

CONTROL AIR PRESSURE LOW	H-1-a
SVC AIR DISCH VLV CLOSED	M-2-b
RCVR1 PRESS LO	M-3-a
RCVR2/INST AIR PRESS LOW	M-3-b

The standby air compressor starts. When the scram air header pressure drops, the control rods begin to drift in and then scram. The scram discharge volume isolates.

Instrument Air auto isolation valve V-6-395 remains open.

Hotwell level increase.

CRD automatic flow control is lost, closing the FCV.

Feedwater regulating valves lock up.

Heater levels drop.

MSIVs close.

MG set scoop tube lock up.

RCU isolates.

Drywell sump and equipment drain tank valves close.

Isolation Condenser vent valves close.

Other valves fail as identified in the procedure.

To ensure that the automatic actions occur from loss of air pressure and not from RPS or other control circuits, the following are activated prior to the loss of air:

1. Malfunction RPS-6, Failure to Scram
2. LOA- CAS-21, ARI failure to initiate
3. CLF-Bistable-NSS-11 through 18, Fail MSIV Hi Flow Isolation
4. Place Mode Switch in Shutdown to prevent Steam Line Low Pressure MSIV closure

The following data was recorded on the 8 pen recorders:

T:PT3	Instrument air supply pressure indicator (PI-7F52)
PCASISRM	Scram air header pressure
PCASSARD	Service Air Common Header Pressure
LCFWCST	Condensate Storage Tank Level

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Results:

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Two field changes were made to the test procedure to renumber a CLF and to defeat the Reactor Mode Switch Manual Scram.

All alarms and automatic actions occurred as specified in the procedure after the field changes.

The MSIVs closed early in the event causing a reactor scram signal from High Neutron Flux followed by Reactor High Pressure. The reactor did not scram because of the active malfunctions. The EMRVs, Recirc Pump Trip, and Isolation Condensers actuated. The feedwater reg. valves locked in position and, with no operator action, the reactor vessel overfilled.

The control rods were observed to insert more slowly than during a normal scram, a condition indicative of loss of air pressure to the scram solenoids.

AVAILABLE OPTIONS:

(1) Leak size 0 - 100%

(2) Ramp time 0 - 14,400 secs

(3) Delay time 0 - 28,800 secs

OPTIONS TESTED:

Leak, 100%

Ramp time 300 sec

Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

1. IC-15, Full Power
2. Activate Malfunctions RPS-5 & RPS-6 RPS Failure to Scram
3. Activate LOA CAS-21 ARI Failure to Initiate
4. Activate CLFs Bistables NSS-11 to 18 MSIV Hi Flow Isolation Failure
5. Place Mode Switch to Shutdown Prevent Low Pressure MSIV Closure

FINAL TEST CONDITIONS:

Run Time: 1.5 Hours

At the conclusion of this test, the control air system is depressurized. The reactor is shutdown and isolated. The simulator is capable of continued simulation of recovery operations. Since the malfunction is not recoverable, IC reset is required to restore the air system and perform normal operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS05
14.6.21.3

TITLE: Loss of Offsite Power Sources

PREPARED BY/DATE: [signature] / 10/29/97

TEST DATE: 08/04/97

APPROVED BY/DATE: [signature] / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the

parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

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TEST DESCRIPTION:

Malfunction Cause: Protective relay action on breakers SD, NC, OC, OD, 5 and 6 causing breakers to open.

Transmission grid suffers severe heavy weather resulting in simultaneous relay action causing interties between OC substation and grid to open, resulting in loss of all off site power.

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Primary Effects:

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When severe weather causes protective relay action on the JCP&L and Atlantic Electric Substation grid, causing transmission line breakers to open simultaneously:

Turbine trips from fast closure of turbine control valves.
Generator OCBs open.
Reactor scram.
Both diesel generators fast start and energize Swgr 1C and 1D.
Turbine Bypass valve(s) open as indicated on Panels 7F and 13R to control pressure.

Indicators on Panel 12F:

N-1028 Line amps and megawatts decrease to zero
0-1029 Line amps and megawatts decrease to zero
S-2045 Line amps and megawatts decrease to zero
Transformer Bank 7 amps and megawatts decrease to zero
Transformer Bank 8 amps and megawatts decrease to zero
230 KV voltage decreases to zero
Gross Megawatts decrease to zero

Dilution plant annunciators on Panel 12-XR "DILUTION PLANT LOSS OF POWER" alarms and applicable dilution plant equipment annunciators alarm.

Running pond pump trips and both Fire Pumps start.

Generator and transformer temperature recorder on Panel 12XR shows decrease.

Relays on Panel 12R for startup transformer trip.

Generator output recorder on Panel 12R shows decrease to zero.

All control rods fully inserted as indicated on Panel 4F.

Components supplied from 4160V Swgr 1C and 1D trip off if running and sequence back on after diesel generator output breaker closes.

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Annunciators associated with equipment supplied from 460V MCC will alarm.

Loss of the following loads:

`1A Bus'
Circulating water 1-1 and 1-2
Condensate pump 1A
Recirc pump NG01-A, C, E
Reactor Water cleanup Pump ND02-A
Bus 1C
Feed pump 1A

`1B Bus'
Circulating water pumps 1-3, 1-4
Condensate pumps 1B, 1C
Feed pumps 1B, 1C
Recirc pumps NG01-B, D
Rx water cleanup pump ND02-B
Bus 1D

Bypass valves close on loss of condenser vacuum and isolation condensers initiate.

The following data was recorded on the 8 pen recorders:

SOEDMLNM MNTOU & LRBE "N" MW/MVAR

SOEDMLOM	MNTOU & LRBE "O" MW/MVAR
SOEDAECM	ATLNTC ELEC CO. MW/MVAR
SOEDWTSM	WARETOWN "S" MW/MVAR
SOEDWTRM	WARETOWN "R" MW/MVAR
SOEDWHQM	Q-121 MW/MVAR
SOEDWTQM	WHITINGS "Q" VOLTS
EEDSC	4160V BUS 1C VOLTAGE
EEDSD	4160V BUS 1D VOLTAGE
AEDSCM	4160V BUS 1C CURRENT
AEDSDM	4160V BUS 1D CURRENT

The Sequence of Alarms Recorder (SAR) was also attached.

Results:

Most of the monitored variables did not plot properly. The reviewer found that they are not needed to evaluate the response.

Overall response of the plant was good. All expected alarms and automatic actions occurred and no unwarranted alarms were received.

AVAILABLE OPTIONS:

Delay Time 0-28,800

OPTIONS TESTED:

Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the malfunction has been cleared and Offsite Power is restored. The plant remains in a post scram, isolated condition with AC power supplied by the Diesel Generators. The simulator is capable of continued simulation should the instructor wish to continue recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS06
14.6.11.2

TITLE: 4.16 KV Emergency Switchgear 1C and/or 1D Fault

PREPARED BY/DATE: John Solohaviz / 10/25/00

TEST DATE: 08/03/00

APPROVED BY/DATE: Adam H. Meyer 10/31/00

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5 3.1.2(3) Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: A fault on Bus 1C or 1D actuates 51N ground overcurrent relay tripping supply breaker 1C or 1D.

Primary Effects:
The following occurs after the trip of Bus 1D:

(1) Loss of Power annunciators:

Engraving	Location
MN BRKR 1D TRIP	T-1-e
MN BRKR 1D 86 LKOUT TRIP	T-2-e
BUS 1D VOLTS LO	T-3-e
BUS 1D VOLTS LO-LO (UV)	T-4-e

(2) Loss of Power Indications:

Indication	Location
4160 Bus 1D amps downscale (zero),	8F/9F
Half scram (due to loss of one RPS channel)	4F

(3) Trips Occur:

Bus 1D lockout (86-1D/HR)	12R
Bus 1D under voltage (27-1D)	12R
460V breaker 1B1M	8F/9F
460V breaker 1B1P	8F/9F

(4) EDG No. 2 does not idle start due to lockout condition on Bus 1D.

The SAR printout was attached.

Results:

All annunciators identified in the procedure alarmed. No unexpected alarms were noted. Automatic actions occurred as specified in the procedure.

During completion of the test paperwork/results a reactor scram occurred. This was due to a continued loss of condenser vacuum which takes a reasonable period of time to bleed off before occurring. This was not expected but was found discussed in the previous years test under the Deficiencies Found section. This has now been written into the test procedure.

AVAILABLE OPTIONS:

(1) EDS-2A	Bus 1C
EDS-2B	Bus 1D
(2) Delay time	0-28,800 sec

OPTIONS TESTED:

(1) EDS-2B Bus 1-D
(2) Delay Time 0 sec

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power

Start Loads on 1B1 and 1B2 Unit Substations:
B CRD Pump
#2 Air Compressor

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of the test, the malfunction has been cleared and DG-2 has fast started to power 1-D Bus. All Unit Substations powered by 1-D Bus are energized.

The simulator is capable of continued simulation should the instructor wish to continue recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

During the previous testing in 1996, Operations personnel noted that this event should cause a loss of vacuum, resulting in a reactor scram and a turbine trip. The loss of power will cause both condensate transfer pumps to trip, removing seal water from the Auxiliary Flash Tank Pumps and from the Steam Jet Air Ejector Drain Pumps. The loss of seal water will allow air to leak into the condenser causing a scram in approximately 20 minutes. The reviewers recommended that this feature be added to the simulator. A Simulator Task Assignment (1197) was issued and a simulator upgrade preformed. This test did produce the expected plant scram.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS07
14.6.9.2

TITLE: Emergency Diesel Generator Trip

PREPARED BY/DATE: [signature] / 10/29/97

TEST DATE: 08/04/97

APPROVED BY/DATE: R Davidson / 12/15/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the

parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Spurious actuation of engine protection relaying PS-39-720(721)

Primary Effects:

With diesel generator paralleled to the 1C/1D bus, when the selected engine cooling water pressure switch actuates, the diesel engine trips:

INDICATIONS:

EDG 2 DISABLED annunciator T-4-f
EDG 2 KW indication decreases to zero
EDG 2 KVARS indication decreases to zero
EDG 2 Ammeter indication decreases to zero
EDG 2 Kilovolt indication decreases to zero
EDG 2 Unit IDLING light extinguished when DG Speed is < 200 RPM
Bus 1B Amps and KW increase
Bus 1D Amps increase

The following data was recorded on the 8 pen recorders:

EEDSD	VOLTG BUS D
SDGNRM(2)	EDS Real Load MW
ADGNM(2)	Diesel Gen. current
VDGNM(2)	Diesel Gen. Term voltage
ODGNM(2)	EDGN02 RPM (Speed)

AEDSDM	4160V Bus 1D Amps
AEDSUBM	4160V Bus 1B Amps
VEDSBM	4160V bus 1B KW

Results:

The single annunciator identified in the procedure alarmed and cleared as specified. One additional annunciator, EDG2 Control DC LO/LOST also alarmed and cleared, as would be expected. All automatic and instructor controlled actions occurred as required.

The plotted data shows that the simulator response is very realistic. Transfer of running loads from the B Bus to the DG and back properly affected amps and voltage on the monitored buses.

AVAILABLE OPTIONS:

(1) EDG1 DGN-2A
    EDG2 DGN-2B

(2) Time delay 0 - 28,800 sec

OPTIONS TESTED:

(1) DGN-2B

(2) Delay Time: 0 Seconds

INITIAL CONDITIONS FOR TEST:

(1) IC-15, Full Power

(2) Start diesel No. 2 and parallel to bus 1D

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of this test, the malfunction has been cleared and DG 2 is again paralleled to 1D bus as it was before the malfunction was activated. The DG can be stopped per normal operating procedures. The simulator is capable of continued simulation.

The simulator passed this test .

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS08
14.6.11.1

TITLE: 4.16 KV Bus 1A and/or 1B Fault

PREPARED BY/DATE: [signature] / 8/2/99

TEST DATE: 07/29/1999

APPROVED BY/DATE: R Davidson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5 3.1.2(3) Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Actuation of relay 51N, Ground Overcurrent.

Loss of power to either 1A/1B or both 4.16 KV bus due to supply breaker 1A/B tripping.

Assume the simulator is at IC-15, full power operation, when the fault occurs, tripping normal power supply breakers 1A/1B.

(1) Loss of Power Annunciators:

Engraving	Location
MN BRKE 1A TRIP	S-1-e
MN BRKR 1A 86 LKOUT TRIP	S-2-e
BUS 1A UV	S-4-e
LKOUT RELAY 86/S1A TRIP	S-1-b
BUS 1C VOLTS LO	T-3-a
MN BRKR 1C TRIP	T-1-a
BUS 1C VOLTS LO-LO (UV)	T-4-a
PROT SYS PNL 1 PWR LOST	9XF-3-a

(2) Loss of Power Indications:

Indication	Location
4160V Bus 1A volts downscale	8F/9F
Aux. Bus 1A megawatts downscale	8F/9F

Aux. Bus 1A main breaker 1A "CLOSED" light extinguished	8F/9F
Aux. Bus 1A amps downscale	8F/9F

(3) Interlocks:

Main Breaker 1A trips - Prevents S1A	8F/9F
from closing	8F/9F
Trips 1C	8F/9F

(4) Loss of equipment on undervoltage trip with associated indication and annunciators.

(5) Loss of Bus 1C equipment protected by undervoltage trips.

Diesel Generator No.1 fast starts after 3 seconds

USS-1A1 with its MCCs and loads trips

(6) Half scram signal to RPS on panel 4F

The following data for the 8 pen recorders was not obtained as the recorder failed:

EEDSA	4160 volt bus 1A voltg
EEDSC	4160 volt bus 1C voltg
AEDSUAM	4160 volt bus 1A current
AEDSCM	4160 volt bus 1C current
SEDSUAM	4160 bus 1A load

The following were monitored using datapool monitoring:

JEDSSA	4160 volt bus 1A status
JEDSSC	4160 volt bus 1C status

The Sequence of Alarms Recorder (SAR) was also attached.

Results:

The procedure anticipates the trip of Bank 8 OCB. During this test, Bank 5 OCB tripped instead of Bank 8 OCB. The reviewer found this acceptable.

All alarms and automatic actions occurred as expected and no unwarranted actions occurred.

As expected, on loss of 1A bus, reactor power decreased from the trip of 3 recirc pumps. One Feedwater pump and one condensate pump also are lost, but the load reduction is enough to allow continued operation with 2 Feed Pumps. The generator did not trip during this test. Because the voltage regulator trips when Bus 1A is lost, the generator load reduction results in high excitation voltage. Depending on the initial voltage regulator settings, the generator may trip on overexcitation.

AVAILABLE OPTIONS:

(1)	EDS-1A	Bus 1A
	EDS-1B	Bus 1B
(2)	Delay time	0 - 28,800 sec

The response to option EDS-1B would be significantly different, resulting in a reactor scram.

OPTIONS TESTED:

(1) EDS-1A Bus 1A Breaker trip

(2) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power

Balance the Manual Exciter Field Rheostat control 70M (Panel 8F) with the output of the amplidyne. This will ensure the main generator will not trip on overexcitation when the amplidyne is lost.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the 1A Bus fault malfunction has been cleared and power restored to the 1A Bus via the startup transformer. The reactor is operating at reduced power with 3 of 5 recirc pumps and 1 of 3 feedwater pumps tripped. Diesel Generator #1, supplying the 1C Bus is paralleled and connected to 1A Bus.

The simulator is capable of continued simulation of recovery events. Plant procedures, however, would require a manual scram.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE
TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS09
14.6.11.3

TITLE: Loss of 460 V Unit Substation

PREPARED BY/DATE: [signature] / 7/24/97

TEST DATE: 07/01/97

APPROVED BY/DATE: R Wandson / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Ground on the 4160V feeder to the affected bus.

Relay 50G ground sensing actuates, tripping the 4160V feeder breakers 1A1P, 1A2P, 1A3P, 1B1P, 1B2P, or 1B3P/all.

Primary Effects:

The following occurs following the trip of USS1A1:

1. Loss of Power Alarms:

Engraving	Location
FDR TO 460V 1A1 TRIP	S-6-f
1A1 MN BRKR TRIP	U-1-a

(2) Loss of Power Indication:

Indication	Location
460 Bus 1A1 amps downscale	8F/9F
Main breaker 1A1M "CLOSED" indicating lights extinguished	8F/9F
Main breaker 1A1P closed indicating lights extinguished	8F/9F

(3) Loss of Loads (NOTE 1)

Air compressor 1-1
TBCCW pumps 1-1, 1-2
LDP-A1
MCC-1A11, 1A12, 1A13
Fire Alarms (Trouble) Modules 2,3,5

NOTE 1: See Plant Electrical Load List for loss of loads.

The following data was observed using datapool monitoring:

EEDSA1	480 volt bus 1A1 voltg
YEDSA1 (1)	480 volt bus 1A1 current
SEDSA1M	480 VOLT BUS 1A1 load
AEDSA11	480 volt MCC 1A11 load
AEDSA12	480 volt MCC 1A12 load
AEDSA13	480 volt MCC 1A13 load

Results:

One field change to the procedure was made to use datapool monitoring in lieu of the line printer.

All alarms and automatic actions identified in the procedure operated as expected. Although many additional alarms were received, no unexpected alarms were reported.

AVAILABLE OPTIONS:

(1) EDS-3A	USS1A1
EDS-3B	USS1A2
EDS-3C	USS1A3
EDS-3D	USS1B1
EDS-3E	USS1B2
EDS-3F	USS1B3
(2) Delay Time	0 - 28,800 sec

OPTIONS TESTED:

(1) EDS-3A, USS 1A1

(2) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

(1) IC-65, Full Power

(2) Verify the loads listed below are being supplied from USS1A1:

Turbine Bldg. CCW pump 1-1

Turbine Bldg. CCW pump 1-2
Air compressor 1-1
Ltg. Dist. Pnl A1
MCC 1A11
MCC 1A12

MCC 1A13

Stator cooling Water pump 1-1
Gland Steam Exhauster Blower 1-1
Iso Phase Fan 1-1

FINAL TEST CONDITIONS:

Run Time: 45 Minutes

At the conclusion of this test, the malfunction has been cleared and power restored to USS 1A1.

The simulator is capable of continued simulation should the instructor wish to continue with recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

Plant procedure 2000-OPS-3024.10b, Electrical Distribution - 460 VAC Diagnostic and Restoration Actions, Rev. 4, was also used to evaluate the test results.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

No simulator performance problems were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985

TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS10
14.6.11.14

TITLE: Loss of 460 V MCC Train A

PREPARED BY/DATE: [signature] / 10/28/97

TEST DATE: 08/04/97

APPROVED BY/DATE: R Davidson / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the

parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Short circuit on bus causing supply breaker to trip.

Failure of any/all of the 460V MCCs 1A11, 1A12, 1A13, 1A12A, 1A11A, 1A21, 1A21A, 1A21B, 1A22, 1A23, 1A245, 1A31

Short circuit develops on selected MCC bus causing MCC supply breaker to trip.

Primary Effects:

The following occurs for Failure of MCC1A13:

(1) Control Room Indications:
Exhauster No. 1 Red and Green indicator lights out 7F

(2) Generator amplidyne stops

(3) Loss of electrical loads on affected MCC as identified in Plant Electrical Power supply Data. (All loads are not verified during this test)

(4) Main Transformer M1A CLG PWR Fail and M1A Trouble alarms (R-6-e & R-7-e) annunciate.

(5) Turbine Building Operating Floor radiation levels increase on R-014A-4.

The following data was recorded on the 8 pen recorders:

EEDSA13	480 VOLT MCC 1A13 VOLTG
AEDSA13	480 VOLT MCC 1A13 CURRENT
AEDSA1MM	XFORMER 1A1 Current
AEDUAM	Unit Aux XF A Ammeter

Results:

All annunciators identified in the procedure alarmed.
Automatic operations occurred as expected.

AVAILABLE OPTIONS:

(1)	EDS-14A	MCC1A11
	EDS-14B	MCC1A11A
	EDS-14C	MCC1A12
	EDS-14D	MCC1A12A
	EDS-14E	MCC1A13
	EDS-14F	MCC1A21
	EDS-14G	MCC1A21A
	EDS-14H	MCC1A21B
	EDS-14J	MCC1A22
	EDS-14K	MCC1A23
	EDS-14L	MCC1A24
	EDS-14M	MCC1A31

(2) Delay time 0-28,800 sec

OPTIONS TESTED:

(1) EDS-14E (MCC1A13)

(2) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of this test, the malfunction has been cleared and power returned to MCC1A13. Loads which require operator action to start have not been restored. The simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS11
14.6.11.5

TITLE: Loss of Vital Panel Bus

PREPARED BY/DATE: [signature] / 8/9/99

TEST DATE: 08/04/1999

APPROVED BY/DATE: R Davidson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the

parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: ATS output leads open causing power failure to the vital panel VLDP-1 or VACP-1 bus.

Primary Effects:
The following occurs after the failure of VACP-1

(1) Annunciators:

VACP-1 PWR LOST	9XF-3-b
FAP Trouble	K-6-e
Core Monitor	R-8-c

(2) Loss of Power Indications

Indication	Location
The following indicators fail downscale:	
SERVICE WATER HDR PRESSURE	5F/6F
CONDENSATE STORE TK LEVEL	5F/6F
INSTR AIR SUPPLY Pressure	7F
R.B. COOLING WATER HT EXCHR DISCH Pressure	13R
SEAL OIL PRESSURE	8F/9F
HYDROGEN PRESSURE & PURITY	8F/9F

(3) Control power lost to air Comp. 1-1 and 1-2 7F

(4) SGTS & RB Vent valves fail and lose position indication as specified in the procedure.

The following data was recorded using datapool monitoring:

SEDSVAC1(2)	120 VAC VITAL PWR PNL LOAD
YEDSVAC1(2)	120 VAC VITAL PWR PNL CURRENT
EEDSVAC1	120 VAC VITAL PWR PNL VOLTG
T:P1A18	RBCCW COMMON HXs OUTLET PRESSURE

Results:

One field change was made to the procedure during execution to correct the location of the secondary containment isolation reset button.
The FAP TROUBLE alarm K-6-e, did not actuate as expected in the procedure. A TR was issued.

All other alarms and indications operated as expected in the procedure.

AVAILABLE OPTIONS:

(1)	EDS-5A	Bus VLDP-1
	EDS-5B	Bus VACP-1
(2)	Delay Time	0-28,800 sec

OPTIONS TESTED:

(1) EDS-5B, Vital AC Panel 1 (VACP-1)

(2) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the malfunction has been cleared and power restored to all buses. The Secondary Containment isolation signals have been reset and normal ventilation is in operation. The simulator is capable of continued simulation of recovery operations.

The simulator passed this test with one new TR issued.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

Annunciator K-6-e, FAP TROUBLE, did not alarm as expected. TR 3810 was issued to correct the problem by November 1999.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS12
14. 6.11. 6.00

TITLE: Loss of 120 V Continuous Instrumentation Panel #3, (CIP-3)

PREPARED BY/DATE: John Sollakey / 8/28/00

TEST DATE: 08/04/2000

APPROVED BY/DATE: Adam H. Levey / 9/14/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: ATS output leads open.

Loss of power to the 120 volt continuous instrument bus.

Primary Effects:

Annunciator:
CIP-3 PWR LOST 9XF-4-b

Loss of Power Indicators:

The following indicators fail:

The indicators are listed in: 2000-RAP-3024.02, Alarm Response Procedure.

TEST DESCRIPTION: (cont.)

The following actuation's take place:

The actuation's are listed in: 2000-RAP-3024.02, Alarm Response Procedure.

The following recorders fail as is:

The recorders are listed in: 2000-OPS-3024.10f.

The following alarms will be received:

The alarms are listed in:
2000-OPS-3024.10f.

The Following Data was recorded using datapool monitoring:

CIP3(1)	120 VAC CONT INST PNL 3 LOAD
YEDSCIP3(1)	120 VAC CONT INST PNL 3 CURRENT
EEDSCIP3	120 VAC CONT INST PNL VOLTG3

Results:

Field changes were made to the test procedure to detail the loss of CIP-3 instruments, actuation's, and alarms. The field change incorporated the use of the plant's Response to Alarm Procedure, procedure 2000-RAP-3024.02 to identify the expected responses.

The alarms, actuation's and loss of indications identified in 2000-RAP-3024.02 did perform as the malfunction was implemented. The responses were correct.

All of the expected actions in procedure 2000-RAP-3024.02 occurred including the loss of power to the Digital Feedwater computer DCC X.

On loss of CIP-3, the DCC swaps from DCC X, the primary computer, to DCC Y, the backup computer. Since the DCC Y computer is not functional on the simulator, other indications are programmed to simulate that DCC Y has assumed control, while DCC X is actually controlling. On loss of CIP-3 for a period less than the backup battery life, DCC Y will remain in control until the operator boots DCC X. This is the simulator response that occurred.

AVAILABLE OPTIONS:

Delay time 0-28,800 seconds

OPTIONS TESTED:

Delay Time: 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run time: 1 Hour

At the conclusion of this test, the malfunction has been cleared and power restored to CIP-3. The loads lost in the trip can be restored. The simulator is capable of continued simulation, however a SCRAM occurred. This is to be expected as the deviation from the loss of EPR control and its swap over to the MPR allowed reactor pressure to spike with a corresponding spike in APRM power which gave the simulator the SCRAM. However on re-test, with minimal (normal) deviation between the EPR and MPR no scram occurred.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

Plant Diagnostic and Restoration Procedure 2000-OPS-3024.10f was used to determine the acceptable response.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS13
14.6.11.9

TITLE: Loss of 125 V DC Panel

PREPARED BY/DATE: G May / 11/4/98

APPROVED BY/DATE: R Davidson / 12/7/98

TEST DATE: 07/14/1998

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the

parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Fault on selected system.

Primary Effects:
The following occurs after fault on Distribution Center B (EDS-9B):

Annunciators:

Engraving	Location
1B1 DC LOST	U-2-d
1B2 DC LOST	U-4-d
1B3 DC LOST	U-6-d
BAT CHG B TRIP	U-2-e
A/B BAT CHG DRV MOT TRIP	U-3-e
A-B STAT CHG TROUBLE	U-4-e
BUS IB CNTRL DC LOST	T-5-c
BUS 1D CNTRL DC LOST	T-5-e
BUS A/B UV	9XF-1-d
BATTERY B BKR OPEN	9XF-6-e

Indication	Location
BATT B AMPS downscale	8F/9F
B BATTERY/CHARGER VOLTS downscale	8F/9F
CHARGER B AMPS downscale	8F/9F

Bus Loads Lost:

Continuous Instrument Bus #3 rotary inverter
Control power to
- Bus 1B
- Bus 1D
- USS-1B1, 1B2, 1B3
- Diesel Generator No. 2 switchgear (Backup)

125 VDC Power Panel D
125 VDC Power Panel E
MCC-DC-1
MCL-215-006 for V-16-2
MCL-215-007 for V-16-14

When the malfunction is cleared, the B & C Reactor Feed Pumps and the B Cleanup Recirc Pump trip as DC power is restored to the undervoltage devices.

The following Data was recorded on the 8 pen recorders:

EEDSDDB	125 VDC DIST CENTER B VOLTS
AEDSDDB	125 VDC DIST CENTER B CURRENT
SEDSDDB(2)	125 VDC DIST CENTER B LOAD

The Sequence of Alarms Recorder (SAR) printout was also attached.

Results:

The 8 Pen Recorder was not used. The variables were observed on Datapool, printouts of which are attached.

All automatic actions identified in the procedure occurred as expected.
All expected alarms were received and no unwarranted alarms were recorded.

AVAILABLE OPTIONS:

EDS-9A	Dist. Center A
EDS-9B	Dist. Center B
EDS-9C	Dist. Center C
EDS-9D	Panel D
EDS-9E	Panel E
EDS-9F	Panel F
EDS-9G	MCC DC-1
EDS-9H	MCC DC-2

Delay Time 0-28,800 seconds

OPTIONS TESTED:

EDS-9B 125V Distribution Center B

Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power

Manual and auto transfer switches aligned to normal supply.

FINAL TEST CONDITIONS:

Run time: 1 Hour

At the conclusion of this test, the malfunction has been cleared and power restored to the B 125 VDC Bus via the static charger. A reactor scram, a turbine trip, and a reactor isolation have occurred. The simulator is capable of continued simulation should the instructor wish to continue recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS14
14.6.11.10

TITLE: Loss of 24 V DC Panel

PREPARED BY/DATE: [signature] / 8/9/99

TEST DATE: 08/04/1999

APPROVED BY/DATE: R Davidson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the

parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Trip of A-1 (B-1) battery/battery charger output breaker causes loss of power to a 24V DC Panel.

Primary Effects:
The following occurs - After the failure of 24V DC Panel A:

(1) Loss of Power Alarms:

Engraving	Location
24VDC PP-A PWR LOST	9XF-7-d
IRM HI-HI/INOP I	G-1-e
SRM HI/INOP	G-4-d

(2) Loss of Power Indications:

Indication	Location
IRMs 11 through 14 fail downscale	4F
Half scram from neutron monitors (if mode switch is in startup or refuel)	4F
Rod block (if mode switch is in startup or refuel)	
Process Liquid Monitor Downscale (10F-4-f)	10F
Auto initiation of SBGTS and reactor building ventilation isolation	11R

(3) Bus Loads Lost:

Liquid Process Radiation Monitor RN08B (Panel 1R)
Neutron Monitoring system (Panel 3R)

The following data was monitored using datapool:

EEDSDPA(1)	24/48 VDC PNL A VOLTG
YEDSDPA	24/48 VDC PNL A CURRENT
SEDSDPA	24/48 VDC PNL A LOAD

Results:

All anticipated alarms as identified in the test procedure were received as expected and no unanticipated alarms were noted.

AVAILABLE OPTIONS:

(1)	EDS-10A	Panel A
	EDS-10B	Panel B
(2)	Delay time	0-28,800 sec

OPTIONS TESTED:

(1) EDS-10A 24/48 VDC Panel A
(2) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power.

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of this test, the malfunction has been cleared and equipment affected by the malfunction is verified as returned to service. The Reactor Building Ventilation system was restarted by the operator per the test procedure. The simulator was capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS15
14.6.11.12

TITLE: Loss of 460 V USS 1E1

PREPARED BY/DATE: John Salahuddin / 10/23/00

TEST DATE: 07/20/00

APPROVED BY/DATE: Adam H. Leroy / 10/31/00

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5 3.1.2(3) Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: The supply breaker to the affected bus trips causing loss of power to the selected 480 bus.

The following occurs after the trip of Bus 1E1:

(1) Loss of indication for Redundant Fire Pump, Panel 13R

(2) Loss of Radwaste service water pumps SW-P-001A and 001B which supply augmented off gas system cooling.

(3) Loss of MCC-1E13, MCC-1E14 and MCC-1E15.

NOTE: Loss of MCC-1E13 and MCC-1E14 affects the operation of the augmented off-gas system. The system was in operation at the time of the failure causing the following annunciators to alarm:

Off Gas Bldg Trouble	10XF-5-C
New Rad Waste Trouble	10XF-5-a
Augmented Off Gas ISOL	10XF-3-d
RECIRC FLOW LO/PWR LOST A/B	10XF-4-e/10XF-4-f

The following data was not recorded because the SAR did not function. However, step 7 of the test procedure shows proper operation of:

SEDSE1(2)	480 Volt MCC IE1 Load
YEDSE1(2)	480 Volt MCC IE1 Current
EEDSE1	480 volt MCC IE1 Volts

Results:

Three field changes were made to the procedure to delete operation of an automatic transfer switch per TR 2147 resolution, correct the Local Operator Action 151 vs 111, and to add the verification of the opening of V-7-0031.

All alarms and automatic actions occurred as specified in the test procedure. No unwarranted alarms were reported.

AVAILABLE OPTIONS:

(1) EDS-12 480V Bus 1E1

(2) Delay time 0-28,800 sec

OPTIONS TESTED:

(1) EDS-12A Loss of USS 1E1

(2) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power operation with augmented off gas (AOG) system in service.

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of this test, the malfunction has been cleared and power restored to 1E1. The simulator is capable of continued simulation.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS16
14.6.11.7

TITLE: Loss of 120 V Protection System Panel

PREPARED BY/DATE: E Mroury / 11/11/97

TEST DATE: 07/31/97

APPROVED BY/DATE: R Davidson / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)
MF13	3.1.2(11)	Loss of protective system channel

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Broken lead on output of transfer switch on panel 6R/7R fails.

Power loss to Protection System Panels No. 1/No. 2.

Primary Effects:
The following occurs after the RPS No 1 transfer switch fails:

(1) Annunciators

Engraving	Location
PROT. SYS PNL 1 PWR LOST	9XF-3-a
SCRAM CONTACTOR OPEN	G-1-C

(2) Loss of Power Indications

Indication	Location
Scram solenoid lights extinguished	6R and 4F
TRANS OUTPUT and GEN OUTPUT lights extinguished	6R
RPS MG set volts indicate zero	6R
Half scram	4F

IRMs 11 through 14 fail downscale	4F
APRMs 1 through 4 fail downscale	4F
LPRMs A and C fail downscale	4F
Rod block	4F

(3) Panel Loads Lost

Vacuum Breaker Alarm System Channel A

Fuel Zone Water level Instrument Channel A

Neutron Monitor system

Key Card system (Not simulated)

Steam Line Radiation Monitor

Scram solenoids and Logic

Vital Area Alarm System (Not simulated)

Panel 18R - Analog Trip system-High, Low, Low-Low RPV Level.

NOTE: With a loss of power from Prot. system Panel 1, Panel 18R will be supplied from DC Panel "F", Bkr #11, and DC Panel "D", Bkr #22, automatically.

The following data was recorded on datapool monitoring:

EEDSPSP1	120 VAC PROT SYS PNL 1 VOLTG
YEDSPSP1(2)	120 VAC PROT SYS PNL 1 CURRENT
SEDSPSP1(2)	120 VAC PROT SYS PNL 1 LOAD

The SAR printout was attached.

Results:

The DCC Y Trouble alarm and the DFRCS Trouble alarm (J-8-c) did not clear after clearing the malfunction. This is acceptable since the Y DCC is not simulated.

All alarms and automatic actions occurred as specified in the procedure. Although several additional alarms annunciated, they were all determined appropriate for this event.

AVAILABLE OPTIONS:

(1)	EDS-7A	Protection System Panel 1
	EDS-7B	Protection System Panel 2
(2)	Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) EDS-7A, Protection System Panel 1

(2) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power

FINAL TEST CONDITIONS:

Run Time: 90 Minutes

At the conclusion of this test, the malfunction has been cleared and power restored to the Protection Panel. All systems, except DCC Y, have been returned to the pretest condition and the simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section. Plant Procedure 2000-OPS-3024.10e, Electrical Distribution: Reactor Protection System - Diagnostic and Restoration Actions, was also used to evaluate the test results.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

No simulator performance problems were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS17
14.6.11.4

TITLE: Loss of Vital 460 V MCC

PREPARED BY/DATE: [signature] / 10/27/98

TEST DATE: 07/14/1998

APPROVED BY/DATE: R Davidson / 12/7/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Activation of the solid state overcurrent device trips supply breaker to vital MCC.

Primary Effects:

The following occurs following the trip of MCC1A2:

(1) Loss of Power Annunciators:

Engraving	Location
BAT CHG C1 TROUBLE	U-4-f
VLDP-1 PWR XFER	9XF-1-c
RPS MG SET 1 TRIP	G-2-c
PROT. SYS PNL 1 PWR LOST	9XF-3-a
SCRAM CONTACTOR OPEN	G-1-c
ROD BLOCK	H-7-a

(2) Reactor half scram signal due to loss of RPS 1

(3) Loss of power indication:

RPSMG-1 AC voltmeter downscale	6R
RPSMG-1 Motor RED light extinguished	6R
RPSMG-1 Generator output RED light extinguished	6R
APRM Recorders 1 through 4 downscale	4F

NOTE: If auto trans switch ATS-1AB2 is selected to 1A2, the ATS will transfer with accompanying alarm.

The following data was recorded on the 8 pen recorder:

EEDSV:A2	480 volt vital MCC 1A2 Volts
AEDSV:A2(2)	480 volt vital MCC 1A2 current

Results:

One field changes was made to the test procedure to account for installation of PAIPP-1 since the last test.

Data was not collected on the 8 pen recorder. Trend screens were viewed in place of the recorder.

All annunciators and automatic actions occurred as specified in the procedure. The SAR also recorded C Battery room HVAC Trouble and multiple RPS alarms. The reviewer determined these alarms to be correct.

The test procedure was completed satisfactorily.

AVAILABLE OPTIONS:

(1)Selected Bus	EDS-4A	Vital MCC 1A2
	EDS-4B	Vital MCC 1B2
(2) Delay time	0-28,800 seconds	

OPTIONS TESTED:

(1) EDS-4A VMCC 1A2

(2) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

IC-15 Full Power.

FINAL TEST CONDITIONS:

Run Time: 90 Minutes

At the conclusion of this test, the malfunction has been cleared and all automatic trips are reset. RPS system 1 has been manually transferred to the backup transformer and is not returned to its normal power supply. Power is restored to PAIPP-1 by energizing VMCC 1A2. The simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS18
14.6.3.17

TITLE: Main Condenser Air Inleakage

PREPARED BY/DATE: [signature] / 10/20/97

TEST DATE: 07/31/97

APPROVED BY/DATE: R Davidson / 12/15/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF7	3.1.2(5)	Loss of vacuum, including loss of hotwell level control

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Failure of the seal (boot) between the LP Turbine Exhaust and the main condenser.

A leak develops in the boot of the B LP Turbine. The amount of air inleakage is selected by the instructor with 100% equivalent to total failure.

Primary Effects:
With malfunction CFW-17 activated to 100% the following annunciators alarm:

COND VAC LO 25 INCHES
COND VAC TRIP 1 22 INCHES
COND VAC LO/TURB TRIP I
COND VAC LO/TURB TRIP II
COND VAC TRIP 2 10 INCHES

The main turbine will trip and the reactor will scram. The bypass valves will not open, reactor pressure will increase to 1060 psig where two EMRVs will open to control pressure. Isolation condensers will also initiate at 1050 psig.

The following data was recorded on the 8 pen recorders:

PCNDVACA	Main condenser vacuum indicators (PI-24, 25, 26)
PCNDVACB	
PCNDVACC	
RTCSSV(1)	Turb Stop valve position
RTCSSV(2)	
RTCSSV(3)	

RTCSSV(4)
RTCSBV(1)-(9) Turbine bypass valve position

The Sequence of Alarms Recorder (SAR) printout was attached.

☐

Results:

☐

Except as noted below, all alarms identified in the procedure were received. Additional alarms received are expected for this event.

The procedure stated that the bypass valves would not open. All 9 bypass valves did open on the simulator then closed approximately 1.5 seconds later as #2 vacuum trip was received. This response is acceptable. All automatic actions occurred correctly.

AVAILABLE OPTIONS:

(1) Amount of inleakage 0 - 100% (100%=complete boot rupture)

(2) Ramp time 0-14,400 sec.

(3) Delay time 0-28,800 sec.

OPTIONS TESTED:

(1) 100% Inleakage

(2) Ramp time 0 sec

(3) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

IC-15, full power

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the reactor has scrammed, isolation condensers have initiated, recirc pumps have tripped and the turbine stop & bypass valves are tripped closed on low vacuum. The simulator is capable of continued simulation of recovery events. The malfunction, however, is not recoverable, requiring IC reset to return to normal operation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE
TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

Alarm H-3-f, Reactor High Pressure, did not actuate during the test on July 31, 1997. A hardware maintenance request was submitted. Following maintenance, the transient was run again on October 8, 1997 and alarm H-3-f worked properly.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS19
14. 6. 3. 2.00

TITLE: Hotwell Reject Level Controller Fails

PREPARED BY/DATE: TMay / 9/10/98

APPROVED BY/DATE: R Davidson / 12/7/98

TEST DATE: 08/10/1998

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF7	3.1.2(5)	Loss of vacuum, including loss of hotwell level control
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in

3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty Output from LC-12B

Primary Effects:
The reject level controller will go to the value selected by the instructor. If the output causes the reject valves to open, hotwell level will decrease.

Due to level decrease, the makeup valves will open to try and maintain the hotwell level, condensate flow will increase, condensate pressure will decrease, demin dp will increase, and COND DEMIN dp HI alarm may be received if dp increases to 60 PSID.

The Following Data was recorded on the 8 pen recorders:

T:LT15	Main Condenser B hotwell level indicator (LI-15)
T:FI1	Condensate flow indicator (FI-1)
T:dp1660	Condensate demin dp (dpI-1660)
T:PI34	Condensate pump header pressure indicator (PI-34)
T:XFVRB	Feedwater Reg. Valve B position indication
T:LI35	Condensate Storage Tank Level
R02235	Valve V-2-235 position
R0216	Valve V-2-16 position

The Sequence of Alarms Recorder (SAR) printer was inoperable, therefore the printout was not attached.

Results:

Four alarms, which the procedure says MAY come in were not received because the process variables did not reach the alarm point. This response is correct.

The simulator response agreed with the procedure and was found to be acceptable.

AVAILABLE OPTIONS:

1. Reject Controller Output :	0-100% (100% = Valves Open)
2. Ramp Time:	0-14,400 seconds
3. Delay Time :	0-28,800 seconds

OPTIONS TESTED:

1. Failure:	100%
2. Ramp time:	60 seconds
3. Delay time:	0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the malfunction has been cleared and the plant is recovering from the event. The Hotwell Level is returning to normal. Due to the large volume of water displaced and the design of the level control system, full recovery of level cannot be achieved in a reasonable test time.
The simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section. The Plant response is not severe, allowing complete recovery from this malfunction.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

No simulator problems were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS20
14. 6.36. 1.00

TITLE: Service Water Pump Trip

PREPARED BY/DATE: [signature] / 8/21/00

TEST DATE: 08/11/2000

APPROVED BY/DATE: Adam H. Mesy / 9/14/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF8	3.1.2(6)	Loss of service or cooling water to individual components
MF10	3.1.2(8)	Loss of component cooling system or cooling to individual components

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Undervoltage Detector (52/UVD) opens sending a false undervoltage trip signal to the service water pump breaker.

Primary Effects:

Service water pump trips. SWS pump trip reduces SWS flow. RBCCW Heat Exchanger loses cooling flow, so RBCCW temperature increases, temperature of components cooled by RBCCW rise.

The following data was recorded on the Trend recorders:

T:PI6	SW pump discharge press	T:T43	RBC Hx outlet temp
TSWSHTXO(1)	SW Hx outlet temp	T:T56	RBCCW Drywell Return Temp
WSWSPUMP(1)	SW pump flow	T:T33A	Recirc A Motor Cooler
AEDSA3MM	Bus 1A3 Current	T:T33B	Recirc A Pump Cooler

Results:

The alarms and values of process variables demonstrate that components cooled by RBCCW did indeed experience an increase in temperature and a subsequent decrease when the pump was restarted.

All steps in the procedure were completed satisfactorily. The procedure did not specify any expected alarms but the alarms received were appropriate.

Trend plots on the Instructor Station were used in place of the strip chart recorder and were attached to the procedure.

AVAILABLE OPTIONS:

(1) Pump trip SWS-1A SWS Pump 1-1
SWS-1B SWS Pump 1-2

(2) Delay time 0 - 28,800 seconds

OPTIONS TESTED:

(1) SWS-1A, Service Water Pump 1-1

(2) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power. (SW Pump 1-1 operating)

FINAL TEST CONDITIONS:

Execution Time: 60 Minutes

At the conclusion of the test, the malfunction has been cleared and the Service Water Pump manually restarted. The system temperatures are returning to normal. The Cleanup system has tripped from high temperature and requires operator action to return it to service. The Drywell temperature remains high but is decreasing.

The simulator is capable of continued simulation but requires operator action and run time to return to the original conditions.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE
TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

None

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS21
14.6.33.3

TITLE: Shutdown Cooling Inadvertent Isolation

PREPARED BY/DATE: T Morey / 8/4/99

TEST DATE: 08/04/1999

APPROVED BY/DATE: R Davidson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF9	3.1.2(7)	Loss of shutdown cooling
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant

startup test procedure acceptance criteria;

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Broken wire in panel 3F causes relays 6K15A and 6K15B to deenergize.

Primary Effects:

Inlet and outlet valves V-17-19 and V-17-54 close. Shutdown cooling flow stops. Cooldown will stop.

The following data was recorded on the 8 pen recorders:

T:PRV09A	SDC Pump A discharge press (PI-RV09A)
T:T45D T:T45A	SD cooling/fuel pool temp recorder and digital readout (TR-RV08 (Pts 1 and 4)
T:T43	RBC HX Outlet Temp
T:TE31J	Recirc. Loop Temp

The Sequence of Events Recorder (SAR) printout was also attached.

Results:

All expected alarms were received and all automatic actions occurred as expected.

While the pumps were tripped, the SDC HX Outlet Temperatures were observed to oscillate. Review of the last test in 1995 revealed that this also occurred then but was not noticed.

AVAILABLE OPTIONS:

Time delay 0 - 28,800 seconds

OPTIONS TESTED:

Delay time: 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-18, Shutdown Cooling

FINAL TEST CONDITIONS:

Run Time: 1.5 Hours

At the conclusion of this test, the malfunction has been cleared and the SDC System returned to operation. The simulator is capable of continued simulation.

The simulator passed this test with one new TR issued.

BASELINE DATA USED TO EVALUATE
TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

While the pumps were tripped, the SDC HX Outlet Temperatures were observed to oscillate. TR 3809 was written to correct this problem by November 1999.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS22
14.6.24.1

TITLE: RBCCW Pump Trip

PREPARED BY/DATE: [signature] / 8/4/99

TEST DATE: 08/04/1999

APPROVED BY/DATE: R Davidson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF8	3.1.2(6)	Loss of service or cooling water to individual components
MF9	3.1.2(7)	Loss of shutdown cooling
MF10	3.1.2(8)	Loss of component cooling system or cooling to individual components

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance

Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty overcurrent device trips RBCCW pump.

Primary Effects:

Pump trips causing a reduction in system flow and pressure. With two pumps running, the remaining pump may go to runout; if discharge pressure drops to <75 psig, the pump will runout, and receive an overcurrent trip (at 300a). Temperature of cooled components will increase.

The following data was recorded on the 8 pen recorders:

T:T43	RBC HX Outlet Temperature Recorder
LRBCSGTK	RBC Surge Tank Level
T:PIA18	RBC Pump Discharge Pressure Indicator
TRBCSW1I	RBC HX Inlet Temp
TRBCNRGO	NRHX Outlet Temp
T:T108	DW Temp (Supply)
T:PIP08	DW Press
WRBCPUMP(1)	RBC Pump flow
AEDSA2MM	RBC Pump Amps
T:TTEM1	NG01A No. 1 Seal Temperature
T:TTEM3	NG01B No. 1 Seal Temperature
T:TTEM5	NG01C No. 1 Seal Temperature
T:TTEM7	NG01D No. 1 Seal Temperature

T:TTEM9 NG01E No. 1 Seal Temperature

Results:

During execution of this procedure, 1 field change was made to Correct the Recirc. Pump Seal Temperature variables.

The test was run twice, the first time with RPS frozen to prevent a Hi DW Pressure Scram, Isolation and ECCS initiation. This allowed collection of data and evaluation of automatic actions. The second time, all models were running but the malfunction was cleared and the pump started before reaching Hi Drywell Pressure.

The procedure indicates that the DW Press HI/LO Alarm will come back in on low pressure after the pump is started. Because of a higher initial DW Pressure in the IC, the pressure did not go below the Lo Alarm setpoint. The reviewer found this acceptable. All other alarms identified in the procedure were received and no unwarranted alarms were noted.

AVAILABLE OPTIONS:

(1) Pump RBC-1A P-5-001
RBC-1B P-5-002

(2) Delay time 0 - 28,800 seconds

OPTIONS TESTED:

(1) RBC-1A P-5-001

(2) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power
1-1 RBCCW Pump running
1-2 RBCCW Pump off

FINAL TEST CONDITIONS:

Run Time: 2 Hours

At the conclusion of this test, the malfunction has been cleared and the RBCCW pump restarted. The Cleanup System has been put back in service. The simulator is capable of continued simulation should the instructor need to continue.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS23
14. 6.45.18.00

TITLE: Loss of All Feedwater

PREPARED BY/DATE: John Salahuey 7/11/2000

TEST DATE: 06/28/2000

APPROVED BY/DATE: Adam H. Heery 9/14/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF11	3.1.2(9)	Loss of normal feedwater or normal feedwater system failure
MF12	3.1.2(10)	Loss of all feedwater (normal and emergency)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

This test is used to certify that the simulator will perform the Loss of Normal Feedwater Flow transient as described in the FSAR Update - Section 15.2.7.

With the simulator at 100% power and Reactor level at a low 148 inches, the feedwater and condensate pumps are tripped. Following the Lo Level Scram, the Mode switch is placed in Shutdown to prevent MSIV closure on Steam Line Low Pressure. Reactor water level decreases to Lo Lo Level, causing Primary and Secondary Containment Isolation, Reactor Isolation, Recirc Pump Trip, Isolation Condenser Initiation, and Core Spray Initiation.

Simulation is continued until the Core Spray System returns Reactor Level to normal (>137 inches)

The following simulator control room chart recorders are collected and used to evaluate the test:

1. UR-622-24A&B, Fuel Zone Level
2. ID75, Feedwater/Steam Flow
3. ID14, Reactor Level/Pressure
4. IG02, Isolation Condenser/EMRV Discharge Temperatures ***
5. IA08, Core Delta P/Total Recirc. Flow
6. R105A, IRM/APRM (APRM Ch 1 & 2)
7. ID101, Feedwater Temperature

The Sequence of Alarms Recorder (SAR) alarm printout was also attached.

Results:

All alarms and automatic actions identified in the procedure occurred as expected. A review of the SAR indicates no unwarranted alarms.

AVAILABLE OPTIONS:

There are no options available for this test.

OPTIONS TESTED:

There are no options available for this test.

INITIAL CONDITIONS FOR TEST:

IC-65 Full Power

Reactor level is lowered to 148 inches using the master controller.

The feedwater and condensate pumps are manually tripped.

After the reactor scrams on low water level, the mode switch is placed in Shutdown, and the SRMs and IRMs are inserted.

FINAL TEST CONDITIONS:

Run Time: 2 Hours

At the conclusion of this test, reactor water level has been restored using the core spray system. No malfunctions or other instructor actions were used, so the simulator is capable of continued simulation of recovery actions.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

This is an FSAR transient. FSAR data is normally worst case conditions and may not reflect actual plant response. FSAR data is therefore used with caution.

Relap5 data for a total loss of feedwater prepared for test TTS70, Simultaneous Trip of all Feedwater Pumps, was also used to evaluate this test.

In 1992, a meeting was held with the person responsible for performing Relap5 analyses for Oyster Creek. Although this particular test procedure was not discussed, the analysis for 14.8.2, Total Loss of Feedwater, a very similar transient, was discussed. It is known that an unexpected increase in downcomer water level occurs in the Relap analysis at approximately 175 seconds. This increase was not present in the FSAR data used for comparison since the FSAR data stops at 125 seconds. The simulator did not exhibit a level increase until core spray was injected, the proper response.

The test procedure contains applicable acceptance criteria.

Plant alarm response procedures were also used to treat alarms received as required by this procedure (e.g. Refill of the Isolation Condensers, Tripping of Feedwater and Condensate Pumps, securing Core Spray Injection, Inserting the IRM's and SRM's).

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

No simulator deficiencies were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS24
14.6.6.7

TITLE: Control Rod Blade Stuck

PREPARED BY/DATE: TMoray / 11/9/98

TEST DATE: 08/06/1998

APPROVED BY/DATE: RDavidson / 12/10/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF14	3.1.2(12)	Control Rod Failure (stuck, uncoupled, drift, drop, & misaligned)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Mechanical binding

When the malfunction is activated, the control rod blade will not move using normal drive water pressure or scram accumulator pressure. If the CRDM is concurrently uncoupled from the blade, the CRDM will continue to move (in the withdraw direction), but will not be able to be inserted past the position at which the blade is stuck.

The procedure does not require the automatic recording of data.
The SAR printout was not attached as required by the procedure.

Results:

When actuated by itself, the response to malfunction CRD-7, Control Rod Blade Sticks, is correct.

When combined with Malfunction CRD-8, Control Rod Uncoupled, the results of the test were inconsistent, depending in part on whether the same option is used for both malfunctions (e.g. CRD-7A & CRD-8A) or different options (e.g. CRD-7A & CRD-8B).

AVAILABLE OPTIONS:

(1) Control Rod blade stuck	CRD-7A (XX-YY) CRD-7B (XX-YY) CRD-7C (XX-YY)	CRD-7D (XX-YY) CRD-7E (XX-YY) CRD-7F (XX-YY)

Where XX-YY indicates the core coordinates of the control rod to stick (e.g. 26-27).

A maximum of 6 rods can be selected to stick at any time.

The test procedure allows the test personnel to select any centrally located control rod that is withdrawn to any position between "08" and "40"

(2) Delay time 0 - 28,800 seconds

OPTIONS TESTED:

(1) CRD-7A Control Rod Blade 26-35 sticks at position 24, Delay Time = 0

(2) CRD-8A Control Rod Blade 26-35 is uncoupled, Delay Time =0

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the malfunction was cleared and rod motion was verified.

The simulator passed this test with 1 new TR issued.

BASELINE DATA USED TO EVALUATE

TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE

ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

Depending on how the malfunctions were activated, the control rod either would not uncouple or gave incorrect position indication for the conditions when this malfunction was combined with Malfunction CRD-8, Control Rod Uncoupled. TR 3789 was issued to correct the results. The TR is scheduled for resolution by June 30, 1999.

EXCEPTIONS TO ANSI/ANS 3.5-1985

TAKEN AS A RESULT OF THIS TEST,

INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS25
14.6.6.8

TITLE: Control Rod Blade Uncoupled

PREPARED BY/DATE: [signature] / 8/4/99

TEST DATE: 08/04/1999

APPROVED BY/DATE: R Dawson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF14	3.1.2(12)	Control Rod Failure (stuck, uncoupled, drift, drop, & misaligned)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Spurious uncoupling.

Primary Effects:
The control rod blade becomes uncoupled, but will follow the CRDM in the insert or withdrawn direction. If the CRDM is withdrawn to notch 48, and a coupling check is performed, the CRDM will go to the overtravel position, causing the "ROD OVERTRAVEL" annunciator to alarm on panel 5F/6F.

This procedure does not require the automatic recording of data.

Results:

All procedure steps were completed satisfactorily. Several annunciators alarmed then cleared as expected.

AVAILABLE OPTIONS:

(1) Control Rod blade uncoupled	CRD-8A (XX-YY)	CRD-8D (XX-YY)
	CRD-8B (XX-YY)	CRD-8E (XX-YY)
	CRD-8C (XX-YY)	CRD-8F (XX-YY)

(This malfunction can be active for 1 to 6 rods at any time)

(2) Delay time 0 - 28,800 secs

OPTIONS TESTED:

(1) CRD-8A (14-23) Blade uncoupled

(2) Delay time: 0 Seconds

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power

FINAL TEST CONDITIONS:

Run Time: 15 Minutes

At the conclusion of this test, the malfunction has been cleared and verified as cleared. The simulator is capable of continued simulation, unaffected by the malfunction.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

No problems were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS26
14.6.6.5

TITLE: Control Rod Drifts Out

PREPARED BY/DATE: SMay / 10/14/98

TEST DATE: 08/05/1998

APPROVED BY/DATE: R Davidson / 12/7/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF14 3.1.2(12) Control Rod Failure (stuck, uncoupled, drift, drop, & misaligned)

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Broken collet fingers prevent the rod from seating on the index tube.

Primary Effects:

The control rod will tend to drift out until it reaches notch 48. If an insert signal is demanded, the control rod will insert to notch 00 and will stay there as long as the insert signal is present. If the insert signal is removed, the control rod will start to drift out again. Core neutron flux peaks will result from the control rod motion.

No data is collected automatically.

The SAR alarm printer failed and the printout was not attached.

Results:

All alarms and automatic actions occurred as specified in the procedure. No unexpected alarms were recorded.

AVAILABLE OPTIONS:

(1) Control Rod to drift drift out	CRD-5A (XX-YY)	CRD-5D (XX-YY)
	CRD-5B (XX-YY)	CRD-5E (XX-YY)
	CRD-5C (XX-YY)	CRD-5F (XX-YY)

Where XX-YY are the control rod coordinates.

Any combination of 1 to 6 control rods may be selected to fail.

(2) Delay time 0-28,800 seconds

OPTIONS TESTED:

(1) CRD-5C (18-27) Drifts out

(2) Delay time 0 sec.

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of this test, the malfunction has been cleared and the simulator is capable of continued simulation. The procedure states that the malfunction is not recoverable, but that the malfunction can in fact be cleared by the instructor.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

Plant Abnormal Operating Procedure 2000-ABN-3200.06, Abnormal Control Rod Motion was used in preparing the test procedure.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS27
14.6.44.5

TITLE: Stuck and Uncoupled Control Rod

PREPARED BY/DATE: [signature] / 10/23/97

APPROVED BY/DATE: R Davidson / 12/15/97

TEST DATE: 09/18/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF14	3.1.2(12)	Control Rod Failure (stuck, uncoupled, drift, drop, & misaligned)
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Spurious uncoupling of the drive mechanism and mechanical binding of the control rod blade.

While the plant is in start up, a control rod blade becomes mechanically bound and uncoupled from its drive mechanism. The drive is then fully withdrawn, at which time the control rod frees itself and drops to the drive mechanism's current position.

As the drive is withdrawn to position 48, there should be no observable change in flux level on the neutron monitors.

When the drive reaches position 48 and a coupling check is performed, rod overtravel should be indicated.

When the control rod is unstuck, there should be a rapid increase in flux level observed on all channels of the IRMs.

IRM HIGH and HIGH HIGH indication and alarms should be observed.

Reactor scram should occur.

Fuel failure will occur as indicated by Main Steam Line Radiation High and High High indication and alarms followed by the automatic isolation of the Main Steam Lines.

The Following Data was recorded on the 8 pen recorders:

T:RN06A	MSL Rad Monitor A
T:RN06C	MSL Rad Monitor C
CRRXRHO	Core Reactivity
T:APRM1	APRM 1 Power Level
T:XIRM1	IRM 11 % Power
T:XSRM1	SRM 21 Counts Per Second
CRRXKEFF	K effective
ZCRDinch(69)	Rod Position (26-27)

The SAR and the PCS alarm printouts were also attached.

Results:

The test procedure was written to anticipate fuel failure and subsequent radiation monitor response. No fuel failure occurred on the simulator. In addition, the MSIV closure from Steam Line High Radiation has been removed from the simulator and the plant.

With the exception of no fuel failure, all alarms and automatic actions occurred as expected. No unwarranted alarms or automatic actions occurred.

AVAILABLE OPTIONS:

CRD-8A (xx-yy) and CRD-7A (xx-yy)
CRD-8B (xx-yy) and CRD-7B (xx-yy)
CRD-8C (xx-yy) and CRD-7C (xx-yy)
CRD-8D (xx-yy) and CRD-7D (xx-yy)
CRD-8E (xx-yy) and CRD-7E (xx-yy)
CRD-8F (xx-yy) and CRD-7F (xx-yy)

Delay time: 0-28,800 seconds

NOTE: From 1 to 6 control rods can be selected to stick and be uncoupled concurrently.

OPTIONS TESTED:

Control Rod 26-27 was selected for this test. To ensure high worth, an out of sequence rod was selected.

Delay Time: 0 seconds

INITIAL CONDITIONS FOR TEST:

(1) IC-52, Cold Start up.

(2) Select malfunction:

  (1) CRD-7A: (xx-yy), where control rod (xx-yy) is an out of sequence high worth rod.

  (2) Delay time: 0 seconds

  (3) CRD - 8A: (xx-yy)

  (4) Delay time: 0 seconds and ACTIVATE malfunction.

(3) Other actions:

  (1) Withdraw control rod (xx-yy) to position 48 and perform coupling check, verify rod overtravel.

  (2) Delete malfunction CRD-7A (xx-yy).

FINAL TEST CONDITIONS:

Run Time: 5 Minutes; Setup Time: 4 Hours

At the conclusion of the test, the reactor has scrammed. One malfunction remains active but can be cleared by the instructor. The simulator is capable of continued simulation.

The simulator passed this test with 1 new TR issued.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

Discussions were held with personnel who perform accident analysis for Oyster Creek. It was learned that some approved methods of analyzing this event predict fuel failure while others predict no failure.

The reviewers agreed that the response of the model (no fuel failure) is acceptable.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

When the rod was withdrawn past position 48, the position indication properly went blank. When inserted from the overtravel position, the position indication remained blank. The drive should be capable of inserting from the overtravel position. TR 3744 was issued to correct this problem by 12/17/97.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS28
14.6.45.19

TITLE: Control Rod Maloperation @75% Power & at 100% FSAR Conditions

PREPARED BY/DATE: John Salaberry / 10/20/00
APPROVED BY/DATE: Adam H. Pierey / 10/24/00

TEST DATE:10/12/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF14 3.1.2(12) Control Rod Failure (stuck, uncoupled, drift, drop, & misaligned)

MF29 Spec. 2.3 Abnormal (excessive) control rod worth

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

This test is used to certify that the simulator response to rod manual control system maloperation (operator error) is acceptable.

From 75% power, the maximum worth control rod is rapidly Withdrawn (by CRD pressure) until it is fully withdrawn. The malfunction used for this test allows the control rod to continue to travel out.

The change in neutron flux is evaluated using TIP traces.

No automatic data collection is required. Core performance data is obtained by test personnel using the stimulated Plant Computer System (PCS). Color plots from the PCS CRT and the Sequence of Alarms Recorder (SAR) printout are attached.

Results:

Several minor field changes were made to the procedure to detail data taking, using current simulator equipment, of rod motion and the simulator's response.

The expected Rod Block, APRM HI, and (TIP Room) Area Monitor HI Rad Annunciators alarmed and no unexpected alarms occurred. No automatic actions occurred as a result of the malfunction (malfunction prevents the rod block from stopping the control rod).

Core performance data trended in the right direction as indicated by the TIP traces and the following PCS " Limits" parameter changes:

	1999Δ	2000Δ
MCPR	12.05%	16.30%
MLHGR	10.53%	4.90%
MAPLHGR	7.40%	3.70%
Rx Power	120MWth	88MWth

Note: Test results vary from 1999 to 2000 as the forcing of a printout from PSMS of the core status cannot be controlled and takes some 10 to 15 minutes for the calculation, once forced. However, the results do meet the acceptance criteria, the test procedure was changed to force the calculation in a set timeframe.

Before and After Traversing In-core Probe traces and a picture of the Plant Status Monitoring System 'Core State Calculation' and Plant Computer System Sequence of Alarms from the PCS were printed and attached.

AVAILABLE OPTIONS:

There are no options applicable to this test.

OPTIONS TESTED:

There are no options applicable to this test.

INITIAL CONDITIONS FOR TEST:

IC-16 75% Power, Cycle 15 Core (middle of life)

FINAL TEST CONDITIONS:

Run Time: 90 Minutes

At the conclusion of this test, reactor power is approximately 88 mwt higher than at the start. The malfunction is still active and the control rod remains withdrawn.

The simulator is capable of continued simulation should the instructor need to continue. The malfunction can be cleared and the control rod's position corrected.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains applicable acceptance criteria.

The event is similar to a postulated event described in the FSAR.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

The criteria of the test states the control rod movement should cease at the rod block. A review of the Malfunction Cause and Effect documentation shows this to be incorrect and the continued travel of the control rod till fully withdrawn should be the correct result of the malfunction. Based on this the test is being re-written to revise the acceptance criteria.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS29
14. 6. 6. 1.00

TITLE: CRD Flow Control Valve Fails

PREPARED BY/DATE: [signature] / 11/13/00

APPROVED BY/DATE: Adam H. Melody / 11/06/00

TEST DATE: 08/03/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF15	3.1.2(13)	Inability to drive rods

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Failure of the associated E/P converter causes the selected CRD flow control valve to fail to the position selected by the instructor.

Primary Effects:
Failure of the FCV will cause the CRD System flow to respond as appropriate depending upon the valve position demanded by the instructor. If the flow is increased, the drive water and cooling water ΔP's will increase causing control rod speeds to increase. If flow is sufficiently high, rods may drift in.

If the CRD system flow is decreased, the drive water and cooling water ΔP's will decrease causing slower (or no) rod motion. Additionally, a decreased system flow will reduce the cooling water flow which will cause the CRD mechanism temperatures to increase. If the temperatures increase to 250 degrees F, the "CRD HI TEMP" annunciator will alarm on panel 5F/6F.

In this test, the FCV is failed to the 100% open position, causing the effects noted above.

The following data was recorded on the Instructor Station Trend recorder:

T:FIRD15	CRD Flow
T:FIRD36	CRD Return Flow to Reactor
T:FIRD42	CRD Cooling Water Flow
T:PIRD04	CRD Drive Water Pressure
T:PIRD05	CRD Cooling Water Pressure
T:PIRD19	CRD Charging Header Pressure

Results:

One field change was made to the test procedure to substitute the Instructor Station Trend Plots for the 8 Pen Recorder.

The procedure states that Control Rods may start to drift in if Cooling Water Pressure exceeds approx. 50 psi. During this test, the maximum Cooling Water Pressure was 28 psi. No rod drift occurred.

No alarms were anticipated in the test procedure.

The Control Rod insertion time was faster, from a normal 43.9 seconds to 40.13 seconds when the malfunction was activated.

AVAILABLE OPTIONS:

(1) Valve to fail	CRD-1A NC30A CRD-1B NC30B
(2) Position	0-100% (100%=Full Open)
(3) Ramp time	0-14,400 sec.
(4) Delay time	0-28,800 sec.

OPTIONS TESTED:

(1) CRD-1A FCV fails

(2) Position 100%

(3) Ramp time 30 secs

(4) Delay time 0 secs

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power

FINAL TEST CONDITIONS:

Run Time: 20 Minutes

At the conclusion of this test, the malfunction has been cleared and system parameters have returned to normal. The simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

No simulator problems were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS30
14.6.31.1

TITLE: Fuel Cladding Failure

PREPARED BY/DATE: SMay / 10/26/98

APPROVED BY/DATE: RWarikon / 12/10/98

TEST DATE: 08/06/1998

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF16 3.1.2(14) Fuel cladding failure and associated alarms

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the

simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty fuel causes fuel cladding failure.

Primary Effects:
Main Steam Line radiation monitors peg high. RAD HI-HI I and RAD HI-HI II alarm.

Off Gas radiation monitors indicate increasing radiation levels.

The following data was recorded on the 8 pen recorders:

T:RN06A	Steam Line Rad. Monitor
T:RN06B	(RN06A, B, C, D)
T:RN06C	
T:RN06D	
T:RN12A	Off Gas Rad Monitor
T:RN12B	(RN12A, B)
T:RN1615	Stack Gas Radiation Recorder
T:RN1624	(RN32A, B)

Results:

One field change to the procedure was made to account for a simulator modification.

The Sequence of Alarms (SAR) printer failed and the printout was not attached.

All alarms identified in the procedure were received and no unexpected alarms were noted.

AVAILABLE OPTIONS:

(1) * Fuel failure 0-100% (100% = 100 Micro Curie/cc)

(2) Ramp time 0 - 14,400 seconds

(3) Time delay 0 - 28,800 seconds

OPTIONS TESTED:

(1) 100% fuel failure

(2) Ramp time 60 seconds

(3) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15 - Full Power.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the reactor remains operating with the Off Gas isolated. The Offgas Radiation Monitors remain pegged high. The malfunction is not recoverable. The simulator is capable of continued simulation of recovery events, but the fuel cladding failure can be corrected by IC Reset only.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE
TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS31
14.6.40

TITLE: Main Turbine Trip

PREPARED BY/DATE: [signature] / 10/21/98

TEST DATE: 09/01/1998

APPROVED BY/DATE: R Davidson / 12/7/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF17 3.1.2(15) Turbine trip

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty trip latch on the emergency governor.

The main turbine will trip.

With malfunction TCS-1 activated, note that the emergency governor red trip light on panel 7F is illuminated, the turbine stop valves, control valves, combined reheat valves and extraction steam isolation valves close. The reactor will scram.

The following data was recorded on the 8 pen recorders:

SRXSTOTL	Core Thermal Power
T:XAPRM4	APRM channel 4
PNSSTN(23)	30 inch Header Pressure
WNSSTKST	Total Steam Flow
RTCSCV(1)	Control Valve Position
RTCSCV(2)	
RTCSCV(3)	
RTCSCV(4)	
RTCSBV(1)	Bypass Valve Position
RTCSBV(2)	
RTCSBV(3)	

RTCSBV(4)	
RTCSBV(5)	
RTCSBV(6)	
RTCSBV(7)	
RTCSBV(8)	
RTCSBV(9)	
RTCSSV(1)	Stop Valve Position
RTCSSV(2)	
RTCSSV(3)	
RTCSSV(4)	
RTCSRHSV(1)	Reheat Stop Valve Position
RTCSRHSV(2)	
RTCSIV(1)	Intercept Valve Position
RTCSIV(2)	
T:T47	Feedwater Temperature
WNSSTKRT	Total Recirc Flow
OGENPU	Turbine Speed
VTSI(1)	Turbine Vibration
VTSI(5)	Turbine Vibration
VTSI(10)	Turbine Vibration
TTLOBOH	Turbine Oil Temperature
PTLOBOH	Turbine Bearing Oil Pressure
T:EPT1	Turbine Hydraulic Oil Pressure
PCNDVACA	Main Condenser A Vacuum
T:FID36A,B,C	Individual Feed String Flows

The SAR alarm printout was also attached.

Results:

One Field Change was made to the procedure to accommodate several modifications installed since the test was last performed in 1994.

All alarms and automatic actions occurred as specified in the procedure.

After approximately 60 minutes, the simulator hung. Details are in the Discrepancy section below.

The reactor pressure and level response was excellent, with the Turbine Trip Anticipatory Scram shutting down the reactor, as expected, without receiving a neutron flux spike or scram. Two EMRVs opened to control reactor pressure as expected.

AVAILABLE OPTIONS:

Delay time 0-28,800 seconds

OPTIONS TESTED:

Delay time 0 seconds.

INITIAL CONDITIONS FOR TEST:

(1) IC-15, full power.

(2) Plant computer operating and set to print sequence of alarms (SAR).

FINAL TEST CONDITIONS:

Run Time: 6 Hours

At the conclusion of the test, the reactor has scrammed and isolated. The plant is in a post trip condition as would occur without any operator action.

As stated above, the simulator hung (computers halted) as a result of overfeeding the reactor vessel. This condition caused severe cycling of the EMRVs, eventually causing the Compute Node to fail. Had the simulator not halted, it would be capable of continued simulation of recovery operations.

The simulator passed this test with 1 new TR issued.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

Two Plant Transient Assessment Reports, TAR-OC-018 and TAR-OC-013 were used to prepare the test procedure.

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

One new TR was written during this test:

1. Approximately 60 minutes after the turbine trip, the simulator hangs (CMP Node wait for 27 Data Frames). Lack of operator action along with Feedwater Regulating Valve leakage causes the reactor vessel to go solid. Apparently during previous tests, the feedwater reg valve leakage was smaller or nonexistent, and the simulator did not hang.

TR 3791 written to resolve this problem is scheduled for resolution November 9, 1998.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS32
14.6.16.1

TITLE: Main Generator Trip

PREPARED BY/DATE: [signature] / 10/21/97

TEST DATE: 10/06/97

APPROVED BY/DATE: R Wanderson / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF18 3.1.2(16) Generator trip

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty 86G protective relay actuates causing Generator Trip.

Primary Effects:
Turbine trip and Reactor Scram. Turbine speed will increase immediately after trip.
Circuit Breakers GC1 and GD1 trip.
4160V Breakers 1A and 1B trip.
Auto Closure of 4160 Breakers S1A and S1B.
Generator Field Breaker 41M trips.
Stator cooling water Pumps trip.
Annunciators on MCB 8F/9F alarm:

LKOUT Relay Trip	R-3-d
BRKR GD1 TRIP	R-1-c
BRKR GC1 TRIP	R-1-d
MAIN FIELD BRKR TRIP	R-5-a
Stator Clg Trouble	R-6-c

Indicators on MCB 8F/9F:
Gross megawatts go to zero
AC kilovolts decay rapidly
AC kiloamps decay rapidly
Exciter amps decay rapidly

The following data was recorded on the 8 pen recorders:

SGENR	Main Generator Real Power (Normalized)
SGENI (Normalized)	Main Generator Reactive Pwr MVAR
T:TURB	Turbine RPM
T:PIA92A	Reactor Pressure

RTCBV(1),(2),(3)	Bypass Valve Position
VTSI(9),(10)	Turbine Vibration
TGEAH2O	H2 Gas Temp
TGEACLRI	Stator cooling Water temp
TGEATDO2	Stator Winding temp
TTLOBDRN	Turbine LO Temp
EOEDMLN	230kv Bus voltage

The Sequence of Alarms (SAR) printout was also attached.

Results:

Three field changes were made to the procedure to incorporate diesel generator starting logic changes and the new generator protection system installed since the last time this test was performed.

All annunciators expected in the procedure alarmed as required.
The MSIVs closed in approximately 37.25 seconds, faster than the 60 seconds expected in the procedure. The change is attributed to the DFRCS modification.

All steps in the procedure were completed satisfactorily.

AVAILABLE OPTIONS:

(1) Delay Time 0 - 28,800 seconds

OPTIONS TESTED:

Delay time 0 seconds.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power

FINAL TEST CONDITIONS:

Run Time: 1 Hour, 30 Minutes

At the conclusion of this test, the malfunction has been cleared and the failed lockout relay reset and verified. The simulator is capable of continued simulation should the instructor want to continue scram recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

Transient Assessment Report OC.011, Reactor Scram on Turbine Generator Trip, 11/20/85.

The test results were also compared to the results from the last test on November 24, 1993.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS34
14.6.13.9

TITLE: Failure of Pressure Compensation Inputs to Feedwater Control System

PREPARED BY/DATE: [signature] / 8/9/99

TEST DATE: 08/05/1999

APPROVED BY/DATE: R Davidson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF11	3.1.2(9)	Loss of normal feedwater or normal feedwater system failure
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in

limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction cause: Broken wire at transmitter selected by the instructor.

Primary Effects:

Pressure transmitters ID46A or B or ID45 fails, causing a loss of signal. The following events occur as all 3 sensors are failed in sequence:

(1) On failure of ID46A, a DCC Trouble Alarm is received. DCC continues to control level, having selected B or C pressure sensor

(2) On failure of the second pressure sensor, ID46B, the DCC Trouble Alarm reflashes. Indicated Reactor Pressure (Recorder PTID45) increases slightly from Steam Line Pressure to Reactor Pressure, and reactor pressure is used by Feed Water control.

(3) On failure of ID45, the DCC Trouble Alarm again reflashes, and Recorder ID14 indicates a fixed 1020 psi pressure. The DCC continues to control feed water flow with a minor increase in reactor level.

The following data was recorded on the 8 pen recorders:

T:LID14	Rx level recorder ID14 (LT-ID13A,B)
T:FSID75	Steam flow recorder ID75 (FT-ID33A,B)
T:FFID75	Actual feedwater flow
T:FID38A	Main steam line A flow
T:FID38B	Main steam line B flow
WNSSTKSA	Actual steam flow A line
WNSSTKSB	Actual steam flow B line
T:PID14	Reactor pressure

The Sequence of Alarms Recorder (SAR) printout was attached.

Results:

All automatic actions and alarms occurred as specified in the procedure. The possible increase in reactor water level with failure of the third sensor was not noticeable.

AVAILABLE OPTIONS:

(1) Pressure transmitter	ID46A	FWC-10A
	ID46B	FWC-10B
	ID45	FWC-10C
(2) Delay time	0-28,800 seconds	

OPTIONS TESTED:

(1) All 3 pressure transmitters are failed in sequence. The simulator response is observed with each cumulating failure.

(2) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power.

FINAL TEST CONDITIONS:

Test Time: 30 Minutes

At the conclusion of this test, the malfunction is still active. The Digital Feed Water control system continues to control Reactor Level very well, in accord with the fault tolerant system design.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

No simulator performance problems were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS35
14.6.17

TITLE: Isolation Condenser Return Valve Fails Open

PREPARED BY/DATE: [signature] / 10/26/98

TEST DATE: 08/06/1998

APPROVED BY/DATE: R Davidson 12/7/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF26	3.1.2(25)	Reactor pressure control system failure (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant

startup test procedure acceptance criteria;

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

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Malfunction Cause: Short in control switch on panel 1F/2F which sends open signal to valve actuator.

Primary Effects:
The Isolation Condenser Return Isolation Valve V-14-34 or V-14-35 selected by the instructor inadvertently fails open.

The following occurs when the Instructor Selected Valve fails open:

(1) Annunciator C-4-a COND. A VLVS OFF NORMAL/C-4-b COND. B Valves OFF normal, annunciates.

(2) Annunciator C-7-b Inlet Pipe/shell Temp HI alarm.

(3) Selected valve opens as indicated by indicating lights changing from green to red.

(4) APRMs increase rapidly due to cold water injection when

the valve opens.

(5) Reactor pressure decreases if a scram occurs.

(6) Reactor scram may occur due to hi flux.

The following data was recorded on the 8 pen recorders:

T:TTE37B	IC A Steam inlet temperature Pt. 1 (TE37B)
T:TTE37E	IC A Steam inlet temperature Pt. 2 (TE37E)
T:TTE37A	"A" shell side temperature Pt. 3 (TE37A)
T:LIG07A	Isolation Condenser "A" level indicator (LI-IG07A)
T:PID45	Reactor Pressure (PIT-ID45)
T:LID59A	Rx water level
SNSSAPRM	Rx power
SGENMWMT	Generator MWe
WNSSTKST	Rx steam flow
WNSSTKFT	Feedwater flow
T:FIA72C	Total Recirc Flow
T:FIA60A	Loop A Recirc Flow
T:TE31A	Recirc Pump A Suction Temp

Results:

A field change was made to the procedure to account for a modification to the simulator.

The SAR print out was not obtained as the printer failed.

The malfunction operated correctly in that the selected valve opened as expected. Reactor power increased approximately 8 % over an 8 second period. Shortly after initiation, the Isolation Condenser isolated from high flow in the condensate return line. The reviewer determined that this is the correct response when an IC is initiated at high recirc flow.

The Isolation Condenser temperature response was less than expected by the procedure and did not alarm. The reviewer determined that the temperature response was minimal since the IC isolated shortly after initiation.

During review it was noted that the Isolation Condenser Steam Line temperature instruments decreased when the IC was placed in service. The temperature decreased from 540 F to 440 F. After isolation, the temperature exhibited a curious increase with step decreases every 15 to 30 seconds. TR 3725 was previously written to correct unusual Isolation Condenser Steam Line Temperature response.

AVAILABLE OPTIONS:

(1) Valve	ICS-4A V-14-34 ICS-4B V-14-35
(2) Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) ICS-4A, V-14-34 (A Isolation Condenser)

(2) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of the test, the malfunction has been cleared and the valve has closed. With the malfunction cleared, the simulator is capable of continued simulation.

The simulator passed this test with no TRs.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

Test and review personnel recall plant events similar to this test which resulted in reactor scrams. The plant data from these events could not be recovered for evaluation of this malfunction. Test and review personnel also agreed that isolation of the IC is likely if recirc flow is at or near rated when the IC is initiated.

DEFICIENCIES FOUND, CORRECTIVE

ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

The Isolation Condenser Steam Line Temperature Instrument response could not be explained. TR 3725 was previously written to correct the response.

EXCEPTIONS TO ANSI/ANS 3.5-1985

TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS36
14. 6.20.19.00

TITLE: Steam Leakage Outside Containment on 30" Header

PREPARED BY/DATE: John Sallalmurry / 11/6/00

APPROVED BY/DATE: Adam H. Mesz / 11/10/00

TEST DATE: 08/04/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF1	3.1.2(1)(b)	LOCA inside & outside containment
MF21	3.1.2(20)	Main steam and main feed line breaks (inside & outside)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Piping failure.

A steam leak develops in the 30" header with the leak rate selected by the instructor.

Primary Effects:
With the malfunction activated to the maximum leak rate, the MSIV's close and the reactor scrams. The following primary annunciators on panel 5F/6F will alarm:

MSIV CLOSED I
MSIV CLOSED II
FLOW HI/MN STM LINE AREA TEMP HI HI I
FLOW HI/MN STM LINE AREA TEMP HI-HI II
MN STM PRESS LO I
MN STM PRESS LO II
FLOW MISMATCH
MN STM VLVS OFF NORMAL.

The following data was recorded on the Instructor Station Trend Plots:

T:FID33A	Main steam flow A
T:FID33B	Main steam flow B
T:PID76A	Rx pressure
T:LRE21A	Rx water level
T:FFID75	Feedwater flow
WNSSTKSA	Steamline flow A
WNSSTKSB	Steamline flow B
T:RN06A	Steamline radiation A
T:RN06B	Steamline radiation B
T:PPT1	Steamline pressure
T:TIB13A,B,C,D	Steamline temperature
WNSSTK(89)	Leakage from break (NSS-19)
PTBSTOF	Turbine Bldg. pressure
T:R14A04	Turbine operating floor (ARM)

The Sequence of Alarms Recorder (SAR) printout was also attached.

Results:

Two field changes were made to the procedure to correct monitored variables and lack of a simulator sound system.

All alarms identified in the procedure were received and no unexpected alarms actuated.

The MSIV's closed from High Flow causing an MSIV closure scram.

In reviewing the data, the steam flow from the leak did not develop the expected leak rate of 1200 lbm/sec. The datapool variable measured showed a maximum leak of 986 lbm/sec. This equates to a leak of 986 lbm/sec x 3600 sec/hr = 3.55 Mlbm/hr, or about 50% flow of the reactor's steam output, an acceptable value. Leak flow was expected to peak at 1200 lbm/sec (~60% of rated). No TR was written.

The response of area temperature monitors IB-13B, C, & D were considered inadequate, increasing from 125 F to approximately 150 to 155 F. The procedure anticipated a minimum temperature of >160 F. Using the Mollier Diagram for 1000 psig saturated steam the leak near the closest sensor should read (dependent on distance from the sensor to the leak) of 290 to around 160 degrees. A TR was written.

AVAILABLE OPTIONS:

(1)	Leak size	0-100% (100% = 30" line break)
(2)	Ramp time	0-14,400 seconds
(3)	Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) Leak size 100%

(2) Ramp time 30 seconds

(3) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, 100% Power Operation

FINAL TEST CONDITIONS:

Run Time: 3 Hours, 15 Minutes

At the conclusion of this test, the Reactor is scrammed and isolated, and the turbine has tripped. The simulator must be reset to any IC to resolve the steam line break. The simulator is capable of continued simulation of recovery events.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

The response of area temperature monitors IB-13B, C, & D is considered inadequate in that they only increased to around 150 to 155 F. The procedure anticipated >160 F. A TR was written.

Another issue was the size of the rupture. From measurements made in different ways the expected rupture is in the magnitude of 1200 lbm/sec while the measured flow maximum was less than 1000lbm/sec. This size leak from a ruptured pipe (~50% leakage) is considered acceptable. No TR was written.

DEFICIENCIES FOUND (cont'd)

A single event of a "Nodal temperature <40 degrees" was seen. This is an indication that a single simulator calculation violates a physical law of nature. This was seen one time for each of the three test runs made. The event only exists for a single alarm note and is not repeated. This indicates that the subsequent calculations are back within bounds. There were no observable changes in plant response that manifest this in a noticeable manner. Discussion with Computer Applications personnel indicates that it is not a major issue needing to be addressed and corrected. They did indicate that if the event were repeated many times during a single test this would eventually lead to a physical fidelity issue. It is identified here for trending purposes. No TR was issued.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS37
14.6.3.12

TITLE: Feedwater Line Rupture Outside Primary Containment

PREPARED BY/DATE: [signature] / 8/9/99

TEST DATE: 08/05/1999

APPROVED BY/DATE: R Wanddom 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF11	3.1.2(9)	Loss of normal feedwater or normal feedwater system failure
MF12	3.1.2(10)	Loss of all feedwater (normal and emergency)
MF21	3.1.2(20)	Main steam and main feed line breaks (inside & outside)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance

Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty Weld.

A faulty weld causes rupture of feedwater header after the high pressure feedwater heaters in the turbine building.

Primary Effects:

For the option selected, feedwater will be discharged into the Turbine Building Heater Bay. The feed pumps go to runout. Reactor Level rapidly decreases and a Reactor Lo Level Scram occurs. Reactor Level continues to decrease, reaching Lo Lo Level, resulting in the following:

Reactor Isolation
Recirculation Pump Trip
Isolation Condenser Initiation
Primary Containment Isolation
Secondary Containment Isolation
Standby Gas Treatment System Initiation
Core Spray Pumps Start

Turbine Building Sumps fill rapidly.

The following data was recorded on the 8 pen recorders:

T:LID14	Rx Water Level
T:PIA92A	Rx Pressure
T:FID36A	Feed Pump A Flow Indicator
T:FID36B	B
T:FID36C	C
T:LR37	Suppression Pool Level
T:TI43A	Suppression Pool Temperature
T:T101C	Drywell Temperature
LPCNS	Drywell Floor Drain Sump Level
LTBSSUMP(2)	1-2 Sump Level
LTBSSUMP(3)	1-3 Sump Level
LNSSMPA	Fuel Zone A Level
LNSSMPB	Fuel Zone B Level

Results:

All anticipated alarms were received and no unwarranted alarms were noted. All automatic actions occurred as expected and all steps in the procedure were completed satisfactorily.

AVAILABLE OPTIONS:

1. Location	CFW-12A Inside Containment CFW-12B Outside Containment
2. Leak Size	0 - 100% (100%=rupture of 18" pipe)
3. Ramp Time	0 - 14,400 seconds
4. Delay Time	0 - 28,800 seconds

NOTE: Malfunction CFW-12 has 2 options, inside and outside containment. The test procedure, however, is specific to the outside leak.

OPTIONS TESTED:

1. Location	Outside Containment CFW-12B
2. Size	100%
3. Ramp Time	0 seconds
4. Delay Time	0 seconds

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of the test, the Core Spray System is running but reactor pressure is still above 700 psi. Core Spray injection has not occurred. The simulator is capable of continued simulation of this event. The malfunction is unrecoverable, requiring IC Reset to correct the broken pipe.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

The response is similar to TTS70, Simultaneous Trip of All Feedwater Pumps. Expected results for TTS70 were calculated using RELAP5 Best Estimate Analysis (SIM-OC-323, OCS-5083). The RELAP analysis was performed at 2 setpoints for Lo Lo Level, 86" and 90". The 90" data was used for comparison. The simulator Reactor Level response was close to the RELAP analysis, with the low level setpoint reached at approximately 15 seconds and the Lo Lo reached at 24 seconds.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS38
14.6.3.12.01

TITLE: Feedwater Line Rupture Inside Primary Containment

PREPARED BY/DATE: [signature] / 10/23/97 TEST DATE: 10/06/97

APPROVED BY/DATE: R Danielson / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF1	3.1.2(1)(b)	LOCA inside & outside containment
MF2	3.1.2(1)(c)	Large & small reactor coolant breaks, including demonstration of saturated conditions
MF11	3.1.2(9)	Loss of normal feedwater or normal feedwater system failure
MF12	3.1.2(10)	Loss of all feedwater (normal and emergency)
MF21	3.1.2(20)	Main steam and main feed line breaks (inside & outside)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty weld.

Primary Effects:
Feed flow with a temperature of 315 F will be discharged to the containment. Reactor coolant at saturation temperature will also discharge to containment. The feed pumps will go into runout as indicated by the amber runout lights for all three feedpumps on panel 5F/6F.
Reactor water level will decrease. At 146" the low level alarm comes in, at 138" the scram will occur, and at 90" ECCS will start.
Primary containment temperature and pressure will rapidly increase. When drywell pressure reaches 1.4 psig, the alarm occurs. At 2.9 psig the scram, Isolations and ECCS starts.

The Following Data was recorded on the 8 pen recorders:

T:LID14	RX water level
T:PIA92	RX Pressure (WR)
T:FID36A	Feed pump A flow indicators
T:FID36B	B
T:FID36C	C
T:LAR001	Suppression Pool Level
T:TI43A	Suppression Pool Temp Div I
T:PIP08	Drywell pressure
TPCNDVB	Drywell Bulk Temperature
LPCNS	Drywell floor drain sump level
LNSSMPA	Fuel Zone Level A
LNSSMPB	Fuel Zone Level B
T:F27A System 1	Core Spray Flow
T:F27B System 2	Core Spray Flow

The SAR printout printout was attached.

Results:

Two field changes were made to the test procedure to update the monitored variables and to correct an alarm location.

The Lo Lo Lo Level alarms identified in the procedure did not actuate. This is the normal simulator response to a large LOCA with Core Spray operation. The variable leg of the RE-18 Lo Lo Lo Level instruments is connected to the Core Spray piping. If Core Spray starts before the Lo Lo Lo setpoint is reached, the alarm will not actuate.

The Sequence of Alarms Recorder (SAR) printout was attached. The printout shows MSL High Flow/Area Temp Hi Hi and Trunion Room High Temperature alarms at approximately six minutes into the event. Since these alarms are not expected, the test was run again twice on October 22, 1997. The first time, the transient was stepped through, running 1 minute at a time. The second time, the transient was run normally. The MSL High Flow/Area Temp Hi Hi and Trunion Room High Temperature alarms did not actuate either time. The SAR printout was obtained for the second run and did not indicate the alarms. The reviewer believes that the SAR malfunctioned on the original test.

All other alarms expected in the procedure were received and all expected automatic actions occurred. Many other additional alarms were received, as expected in response to a LOCA. All steps in the procedure were completed satisfactorily after the field changes.

AVAILABLE OPTIONS:

Location	CFW-12A Inside containment CFW-12B Outside Containment
Leak Size	0-100% (100% = rupture of 18" pipe)
Ramp time	0-14,400 sec.
Delay time	0-28,800 sec.

OPTIONS TESTED:

CFW-12A Inside Containment

Leak size: 100%
Ramp time: 60 sec.
Delay time: 0 sec.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power

FINAL TEST CONDITIONS:

Run Time: Approx. 90 Minutes

This malfunction is not recoverable. At the conclusion of this test, the reactor is recovering from a feedwater line break inside the drywell. All ECCS systems (except ADS) have actuated. The simulator is capable of continued simulation of recovery events not included in this procedure.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS39
14.6.19.1

TITLE: SRM Fails

PREPARED BY/DATE: [signature] / 8/9/99

TEST DATE: 08/05/1999

APPROVED BY/DATE: R Davidson / 11/30/99.

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF22	3.1.2(21)	Nuclear instrumentation failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the

simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance critéria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Malfunction of the Log Count Rate (LCR) Amplifier.

Primary Effects:

The selected SRM fails to the percent of scale selected by the instructor.

With the Reactor in Cold Shutdown and the malfunction activated to 100%, the selected SRM will fail to 10E6 cps.

The SRM will indicate upscale on the count rate meter on 4F, and SRM drawer.

The following annunciators will alarm on panel 3F/4F:

SRM HI-HI
SRM HI/INOP
Rod Block (Startup or refuel only with IRMs below range 8)
Blue SRM Rod Block Light (Startup or refuel only with IRMs below range 8)

The UPSCALE HIGH and UPSCALE HIGH-HIGH lights on the SRM drawer will illuminate, as will the HIGH and HI-HI lights on panel 4F for the SRM channel selected.

A rod block signal will be generated by RMC causing a ROD BLOCK alarm.

The procedure does not require automatic recording of data.

Results:

The alarms expected were received. No unanticipated alarms were identified.
The SAR Alarm printout was not attached.

In the IC used, no CRD pumps are running. An Accumulator Level/Pressure Rod Block remains active through the test.

AVAILABLE OPTIONS:

(1) SRM Channel	NIS-1A Channel 21 NIS-1B Channel 22 NIS-1C Channel 23 NIS-1D Channel 24
(2) Failure position	0-100% (100% = 10E6 cps)
(3) Ramp time	0-14,400 seconds
(4) Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) NIS-1A SRM 21 Fails
(2) Failure position: 100%
(3) Ramp time: 30 seconds
(4) Delay time: 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-1, Cold Shutdown

The initial SRM Count Rate was recorded as 60 cps.

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of this test, the malfunction has been cleared and all alarms and trips reset. The simulator was capable of continued simulation, unaffected by the malfunction.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

No simulator deficiencies were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS40
14. 6.19.9

TITLE: IRM Fails

PREPARED BY/DATE: John Solakiewicz / 6/28/00
John Solakiewicz

TEST DATE: 06/28/00

APPROVED BY/DATE: Adam H. Geesey / 9/14/00
Adam Geesey

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF22 3.1.2(21) Nuclear instrumentation failures

MF24 3.1.2(23) Passive malfunctions in emergency systems

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in

3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Malfunction of the DC amplifier. (Actually used the Simulator Malfunction (MALF) set, under Nuclear Instrumentation System (NIS) -- "IRM Fails" malfunctions. This allows the IRM's to be failed up or down scale, with ramp and delay times.

Primary Effects:
The selected IRM fails to the percent of scale selected by the instructor (from 0% = 0% of scale on range 1, to 100% = 40% on range 10).

With the malfunction activated to 100%, the selected IRM indication will fail to 40% of scale (range 10).

The IRM will indicate upscale below the IRM/APRM recorder on 4F, and on the IRM drawer on 2F/3F,.

The following annunciators will alarm on panel 3F:

IRM HI-HI/INOP (I or II, depending on the IRM selected.).

A half scram of associated RPS Channel.

The following annunciators will alarm on panel 5F:

Rod Block on 5F and Rod Select light on 4F extinguishes.

(This procedure does not require the automatic recording of data.)

Results:

The alarms expected were received and no unanticipated alarms were identified.

On 3F Alarms:
IRM HI,HI-HI, INOP lights and on the IRM drawer for the selected IRM illuminate

On 4F Alarms:
HIGH, HI-HI, Dnsl, and RPS ½ Scram (I or II, depending on the IRM selected.).

On 5F Alarms:
Rod Block on 5F and associated Rod Select light on 4F extinguishes.

All steps in the procedure were completed with no discrepancies identified.

Attach a pictorial or SAR printout.

AVAILABLE OPTIONS:

(1) IRM Channel	NIS-9A Channel 11
	NIS-9B Channel 12
	NIS-9C Channel 13
	NIS-9D Channel 14
	NIS-9E Channel 15
	NIS-9F Channel 16
	NIS-9G Channel 17
	NIS-9H Channel 18
(2) Failure position	0-100% (100% = 40% of scale on Range 10)
(3) Ramp time	0-14,400 seconds
(4) Delay time	0-28,800 seconds
(5) Use of Manual Bypass function	

OPTIONS TESTED:

(1) NIS-9C IRM 13 Fails Upscale & Downscale
(2) Failure positions 0 & 100%
(3) Ramp time 30 seconds
(4) Delay time 0 seconds
(5) Use of Manual Bypass function

(1) NIS-9G IRM 17 Fails Upscale & Downscale
(2) Failure positions 0 & 100%
(3) Ramp time 30 seconds
(4) Delay time 0 seconds
(5) Use of Manual Bypass function

INITIAL CONDITIONS FOR TEST:

IC-56, Cold Startup, ~4.5% power

FINAL TEST CONDITIONS:

Run Time: 20 Minutes

FINAL TEST CONDITIONS

At the conclusion of this test, the malfunction has been cleared and all alarms and trips reset. The simulator is capable of continued simulation, unaffected by the malfunction.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

NONE

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

NONE

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS41
14.6.19.19

TITLE: LPRM Fails

PREPARED BY/DATE: [signature] / 7/24/97

TEST DATE: 07/14/97

APPROVED BY/DATE: R Wanttson / 12/6/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF22	3.1.2(21)	Nuclear instrumentation failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the

simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Malfunction of the flux amplifier.

Primary Effects:
The selected LPRM fails to a deviation selected by the instructor.

With the malfunction activated to 100%, the selected LPRM will fail to 125% scale.

The LPRM will indicate upscale on the full core display, the amber light next to the indicator, and the upscale light on the auxiliaries drawers on panel 3R or 4R will be illuminated.

LPRM HI annunciated. Possible rod block and half scram due to APRM HI and APRM HI-HI depending on initial reading of failed LPRM.

The following data was recorded on the 8 pen recorders:

T:XLP067	LPRM (20-41D)
T:XAPRM6	APRM Ch. 6

Results:

One field change was made to the procedure to substitute LPRM 20-41D for LPRM 20-49D. LPRM 20-49D was removed from service by a recent modification.

When the malfunction was activated, all anticipated alarms and automatic actions occurred. APRM HI, APRM HI-HI, and Half

Scram all were received because the initial reactor power was 100%. A Rod Block was not received but a Select Block did occur because APRM 6 Channel is in RPS System 2.

The SAR printout missed several points in the beginning of the event. Several alarms were recorded when clear but were missing from the alarm state.

AVAILABLE OPTIONS:

(1) LPRM to Fail (Where XXX corresponds to a string location and Z corresponds to the axial level of the LPRM). A maximum of 24 detectors can be selected to fail, each with its own individual output and time delay.

NIS 19A (XXXZ)	NIS 19M (XXXZ)
NIS 19B (XXXZ)	NIS 19N (XXXZ)
NIS 19C (XXXZ)	NIS 19O (XXXZ)
NIS 19D (XXXZ)	NIS 19P (XXXZ)
NIS 19E (XXXZ)	NIS 19Q (XXXZ)
NIS 19F (XXXZ)	NIS 19R (XXXZ)
NIS 19G (XXXZ)	NIS 19S (XXXZ)
NIS 19H (XXXZ)	NIS 19T (XXXZ)
NIS 19I (XXXZ)	NIS 19U (XXXZ)
NIS 19J (XXXZ)	NIS 19V (XXXZ)
NIS 19K (XXXZ)	NIS 19W (XXXZ)
NIS 19L (XXXZ)	NIS 19X (XXXZ)

(2) Output: 0-100% (0% = -125, 100% = +125)

(3) Delay time 0-28,800 seconds

OPTIONS TESTED:

(1) NIS-19 (005D) LPRM 20-41D
(2) Output: +125%
(3) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the malfunction has been cleared and the simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

No simulator deficiencies were identified.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

NONE

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS42
14.6.19.20

TITLE: APRM Fails

PREPARED BY/DATE: [signature] / 10/14/98

TEST DATE: 08/05/1998

APPROVED BY/DATE: R Davidson / 12/7/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF22	3.1.2(21)	Nuclear instrumentation failures
MF24	3.1.2(23)	Passive malfunctions in emergency systems

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Failure of the flux averaging amplifier.

Primary Effects:

The selected APRM will fail to the power level selected by the instructor (from 0% = 0% power to 100% = 150% power).

With the malfunction activated to 100% (150% power) the APRM indication on the IRM/APRM recorder on panel 4F reads 150%, the APRM HI-HI/INOP (I or II as appropriate), CHANNEL (I or II as appropriate) and APRM HI annunciators on panel 3F, the HI & HI-HI lights on 4F and the upscale light on the LPRM-APRM Auxiliaries drawer on 3R or 4R (as appropriate) are on.

Half scram and rod block occur.

The procedure does not require the automatic recording of data.

Results:

All steps in the procedure were completed with no discrepancies identified. All alarms expected were received and no unexpected alarms were observed.

The SAR printer failed and the printout was not attached.

AVAILABLE OPTIONS:

(1) APRM to fail - Any number of APRMS can be selected, each with individual output, ramp time, and time delay options.

NIS-20A APRM 1
NIS-20B APRM 2
NIS-20C APRM 3
NIS-20D APRM 4
NIS-20E APRM 5
NIS-20F APRM 6
NIS-20G APRM 7
NIS-20H APRM 8

(2) Failure position	0-100% (100% = 150% power)
(3) Ramp time	0-14,400 seconds
(4) Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) NIS-20F - APRM Channel 1 Fails
(2) Failure position 100%
(3) Ramp time 30 seconds
(4) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-65, Full Power.

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of this test, the malfunction has been cleared. All trips and alarms have been reset. The simulator is capable of continued simulation, unaffected by the malfunction.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

NONE

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

NONE

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS43
14.6.20.7

TITLE: Reactor Vessel Level Transmitter Fails

PREPARED BY/DATE: John Sololewer / 8/17/00

APPROVED BY/DATE: Adam H. Perry 8/21/00

TEST DATE: 08/11 & 15/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS - N/A

REQUIRED TRANSIENTS (SECTION B.1.2) - N/A

REQUIRED MALFUNCTIONS

MF11	3.1.2(9)	Loss of normal feedwater or normal feedwater system failure
MF13	3.1.2(11)	Loss of protective system channel
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS - N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING
PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Failure of the level transmitter.

The selected level transmitter fails to the output determined by the instructor.

Primary Effects:
The following occurs after the level transmitter failure.

NSS-7A,B ID13A,B
If the channel failed high is selected for level control, Feed Reg valves will close, causing Rx Level to decrease if the failed transmitter is selected.

NSS-7C ID13
Indication will fail

NSS-7D,E,F,G RE05A,B RE05/19A,B
Failed High - Turbine Trip
Failed Low - Reactor scram

NSS-7H,I,J,K RE02A-D
Core Spray Start
Reactor Isolation
Recirc Pump Trip
SBGTS Initiation
Isolation Condenser Initiation
D/G Start.

NSS7M,N,O,Q,S IA90B IA91A,B 1009,11
Fuel Zone Level indication fails.

No data is recorded automatically .

Results:

Level Transmitters (LT) for reactor water level RE02A, B, C, D were selected to fail downscale via Malfunctions (MALF) NSS-7H, I, J, & K. The Simulator performed in accordance the test procedure. Four field changes were added to the procedure for additional detail to describe all alarms received and how to reset one of the alarms after the malfunction is cleared. This portion of the test was satisfactory.

Narrow range Level Transmitters for the Digital Feedwater Control System (DFCS), LT-ID0013A, B, C, were selected to fail downscale via Malfunctions NSS 7A, B, & C. A total of 16 field changes were made to this test procedure with four steps being deleted (as they reflected modified (removed) plant equipment) and 12 steps added to reflect the proper response of the DFCS and expected alarms, and checks to verify effects if the automatic swap over were not to occur, that the system would respond properly to the loss of level. This portion of the test performed satisfactorily.

Next the Reactor Low Water Level Transmitters, LT-RE0005/19A & B were selected to fail both downscale and upscale via Malfunctions NSS 7D, E, F, & G. This testing results in half scrams and half turbine trips. Seven Steps were added to depict panel alarms and verification of expected indication changes. This portion of the test was completed satisfactorily.

Fuel Zone level instruments were tested in two groups: A & B and C & D. Two field changes were required due to modified (abandoned) equipment. Both malfunctions are able to be cleared and the equipment can be verified to be operable. If this test runs too long the turbine would trip and combined with tripping all recirculation pumps the event becomes unrecoverable. There are no plant procedures to recover/return to an operating plant condition directly. This test was completed satisfactorily after the changes were made.

No printouts were required. The field changed procedure was Submitted for revision and approval.

AVAILABLE OPTIONS:

OPTION	Device	FUNCTION
NSS-7A	ID13A	
NSS-7B	ID13B	(Feed Water Control, Narrow Range Gemacs panel)
NSS-7C	ID13	(Wide Range Gemac on 5F)
NSS-7D	RE0519A	RPS (Yarways on 5F)
NSS-7E	RE0519B	RPS (Yarways on 5F)
NSS-7F	RE05A	RPS (Turbine trip input)
NSS-7G	RE05B	RPS (Turbine trip input)
NSS-7H	RE02A	(Core Spray input)
NSS-7I	RE02B	(Core Spray input)
NSS-7J	RE02C	(Core Spray input)
NSS-7K	RE02D	(Core Spray input)
NSS-7L	IA90A	Abandoned
NSS-7M	IA91A	(Fuel Zone A on 5F)
NSS-7N	IA90B	Abandoned
NSS-7O	IA91B	(Fuel Zone B on 5F)
NSS-7P	1008	Abandoned
NSS-7Q	1009	(Fuel Zone C on 5F)
NSS-7R	1010	Abandoned
NSS-7S	1011	(Fuel Zone D on 5F)

(2) Instrument output — 0-100% of range

(3) Ramp time — 0-14,400 seconds

(4) Delay time — 0-28,800 seconds

OPTIONS TESTED:

OPTION	OUTPUT	RAMP	DELAY
NSS-7A	0%	30 sec	0 sec
NSS-7B	0%	30 sec	0 sec
NSS-7C	0%	30 sec	0 sec
NSS-7D	0%	30 sec	0 sec
NSS-7E	0%	30 sec	0 sec
NSS-7F	100%	30 sec	0 sec
NSS-7G	100%	30 sec	0 sec
NSS-7H	0%	0 sec	0 sec
NSS-7I	0%	0 sec	0 sec
NSS-7J	0%	0 sec	0 sec
NSS-7K	0%	0 sec	0 sec
Abandoned NSS-7L	100%	30 sec	0 sec
NSS-7M	100%	30 sec	0 sec
Abandoned NSS-7P	100%	30 sec	0 sec
NSS-7Q	100%	30 sec	0 sec
Abandoned NSS-7R	100%	30 sec	0 sec
NSS-7S	100%	30 sec	0 sec

CONDITIONS FOR TEST:

IC-15, full power, with CRD pump A in service.
Dates testing performed: 8/11 & 15/2000

FINAL TEST CONDITIONS:

Run Time: 3.5 Hours.

Each Option of the malfunction can be cleared independently. Control actions may require IC reset to continue with additional sections of the test procedure. At the conclusion of testing an IC reset is required to continue.

In actual use, this malfunction can be cleared by the instructor.

The simulator passed this test with no Trouble Reports issued.

BASELINE DATA USED TO EVALUATE
TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section. (Revisions -Field Changes- were issued to better describe the expected plant responses.)

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION: NA

Numerous field changes were made to the procedure to add additional detail and to include modifications installed since the test was last performed.

No Trouble Reports were issued during this test.

TO ANSI/ANS 3.5-1985
ACTIONS TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION: None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS44
14.6.20.8

TITLE: Reactor Vessel Pressure Transmitter Fails

PREPARED BY/DATE: [signature] / 10/21/97

TEST DATE: 10/06/97

APPROVED BY/DATE: R Danielson 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF13	3.1.2(11)	Loss of protective system channel
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures
MF24	3.1.2(23)	Passive malfunctions in emergency systems

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the

limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Failure of the pressure transmitter.

Primary Effects:
The selected pressure transmitter fails to the output determined by the instructor.

All options were tested using this procedure. The primary simulator response for each option is:

1. NSS-8A, 8B, 8C & 8D were tested individually resulting in a half scram for each.

2. NSS-8E, 8F, 8G & 8H were tested individually resulting in Isolation condenser initiation logic initiation.

3. NSS-8I & J were tested individually causing Fuel Zone Channel A & B) failure.

4. NSS-8K & L were tested individually causing Fuel Zone Channel C & D failure.

The procedure does not require automatic recording of any data.

The Sequence of Alarms Recorder (SAR) printout was attached.

Results:

All alarms and automatic actions specified in the procedure actuated as expected. Additional alarms associated with the trip of all recirculation pumps were also received.

AVAILABLE OPTIONS:

(1) Instrument to fail	NSS-8A RE03A NSS-8B RE03B NSS-8C RE03C NSS-8D RE03D (Input to RPS) NSS-8E RE15A NSS-8F RE15B NSS-8G RE15C NSS-8H RE15D (Input to Iso. Conds.) NSS-8I IA92A NSS-8J IA92B NSS-8K 1018 NSS-8L 1019 (Input to Fuel Zone level, and press indicators on 5F)
(2) Instrument output	0-100% of range
(3) Ramp time	0-14,400 seconds
(4) Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) NSS-8A, 8B, 8C, & 8D Transmitter RE03A, (B, C, D) fails
Output 100%
Ramp time 30 seconds
Delay time 0 seconds

(2) NSS-8E, 8F, 8G, 8H Transmitter RE 15A (B,C,D,) fails
Output 100%
Ramp time 0 seconds
Delay time 0 seconds

(3) NSS-8I,8J Transmitter IA92A fails
Output 0%
Ramp time 0 seconds
Delay time 0 seconds

(4) NSS-8K,L Transmitter 1018 fails
Output 0%
Ramp time 0 seconds
Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the malfunctions have been cleared and the simulation could be continued. The ability to clear each option available for this malfunction was included in the procedure.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

NONE

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

NONE

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS45
14. 6. 3.13.00

TITLE: Feedwater Flow Transmitter Fails

PREPARED BY/DATE: [signature] / 11/7/00

APPROVED BY/DATE: Adam H Keegy / 11/7/00

TEST DATE: 07/26/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Detector failure

Primary Effects:
The selected feedwater flow transmitter will fail to the value selected by the instructor. With malfunction CFW-13A activated to 100%, note that the A feedwater flow indicator reads full scale. Also, Feed Water Control system will close down on the feed regulating valves causing reactor water level to decrease. A low water level scram will occur when the level decreases to 138".

RX LVL HI/LO alarm (H-7-e) annunciates at 146"
RX LVL LO alarms (H-5-e) & (H-6-c) annunciate at 138"

The following data was recorded on the Instructor Station Trend Plots:

T:LID14	RX Water Level Recorder (LI-A14)
T:FID10A	Feed Pump Flow Indicator (FI-ID10A)
T:FID10B	Feed Pump Flow Indicator (FI-ID10B)
T:FID10C	Feed Pump Flow Indicator (FI-ID10C)
T:PI38	Feed Pump Discharge Pressure (PI-38)
T:PI39	Feed Pump Discharge Pressure (PI-38)
T:PI40	Feed Pump Discharge Pressure (PI-40)

The SAR alarm printout was also attached.

Results:
Two field changes were made to the test procedure to: 1) Replace the 8 Pen Recorder with Instructor Station Trend Plots. and 2) Delete the Feed pump Runout Alarm which was removed by a modification.

All expected alarms were received. Reactor Level decreased and then recovered. The level response is attributed to the Digital Feedwater Control system.

AVAILABLE OPTIONS:

1.	Detector to fail	CFW-13A ID10A CFW-13B ID10B CFW-13C ID10C
2.	Detector output	0-100% 100%=3x10E6lbm/hr (0%=10 ma 100%=50 ma output)
3.	Ramp time	0-14,400 secs
4.	Delay time	0-28,800 sec

OPTIONS TESTED:

(1) CFW-13A

(2) 100% (50ma)

(3) Ramp time 0 seconds

(4) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15. Full Power

FINAL TEST CONDITIONS:

Run Time: 6 Minutes

At the conclusion of this test, the malfunction has been cleared and the simulator is capable of continuing the recovery operations. The reactor has scrammed and the Turbine Generator is tripped.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

No simulator deficiencies were identified during the test.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS46
14.6.23.2

TITLE: Drywell Pressure Transmitter Fails

PREPARED BY/DATE: [signature] / 10/14/98

TEST DATE: 08/05/1998

APPROVED BY/DATE: R Davidson / 12/7/96

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty pressure transmitter.

Primary Effects:

When the selected pressure transmitter fails up scale:

Annunciator C-3-f, DW PRESS HI/LO alarms.

Pressure recorder 12XR6 on panel 12XR indicates full scale of 4.0 psig.

Computer point PT51 indicates full scale.

PNL 4F digital Display indicates full scale.

The following data was recorded on the 8 pen recorders:

T:PT51	Drywell Pressure PT51
T:PIP08	Drywell Pressure PTIP08
T:PT53	Drywell Pressure PT53
T:PT54	Drywell Pressure PT54

The Sequence of Alarms printer failed and was not attached.

Results:

All steps in the procedure were completed. All anticipated alarms were received and no unexpected alarms were noted.

AVAILABLE OPTIONS:

(1) Pressure Transmitter:

PCN-2A	PTIP07
PCN-2B	PT53
PCN-2C	PT54
PCN-2D	PT51

(2) Select Failure 0 - 100% output

(3) Ramp Time 0 - 14,400 seconds

(4) Delay Time 0 - 28,800 seconds

OPTIONS TESTED:

(1) PCN-2D - Transmitter PT51

(2) 100% failure

(3) Ramp time 30 seconds

(4) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 20 Minutes

At the conclusion of this test, the malfunction has been cleared and all indications returned to normal. The simulator is capable of continued simulation, unaffected by the malfunction.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

No simulator deficiencies were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS47
14. 6.28. 5.00

TITLE: RMCS Timer Malfunction

PREPARED BY/DATE: John Soldanowy / 8/21/00

APPROVED BY/DATE: Adam H Lesey / 9/14/2000

TEST DATE: 08/11/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF14	3.1.2(12)	Control Rod Failure (stuck, uncoupled, drift, drop, & misaligned)
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: The timer motor winding opens.

Primary Effects:
The RMCS (reactor manual control system) timer will stop during the signal (insert or withdraw) selected by the instructor.

With malfunction RMC-5A activated for the selected rod, insert the rod by momentarily placing the Rod control Switch in the ROD IN position. Note that the control rod continues to insert after the switch is released because the RMCS timer failure. Deactivate the malfunction and verify that rod motion stops. Activate malfunction RMC-5B and withdraw the rod by momentarily placing the Rod control Switch in the ROD OUT NOTCH position and note that the TIMER MALFUNCTION ROD BLOCK light on panel 4F lights and that rod motion stops.

Results:
The single alarm expected in this procedure was received and cleared as expected. No unexpected alarms were noted. The Rod Block functioned properly.

AVAILABLE OPTIONS:

(1) RMCS timer malfunction	RMC-5A Fails during Insert RMC-5B Fails during Withdraw
(2) Delay time	0 - 28,800 seconds

OPTIONS TESTED:

(1) Both RMC-5A and RMC-5B Timer malfunctions were tested during this test.

(2) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, full power.

FINAL TEST CONDITIONS:

Run Time: 15 Minutes

At the conclusion of this test, the malfunctions have been reset and normal control rod motion is verified. The simulator is capable of continued simulation, unaffected by this test.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

No simulator problems were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS48
14.6.26.8

TITLE: RCU Flow Control Valve Failure

PREPARED BY/DATE: [signature] / 10/14/98

APPROVED BY/DATE: R Davidson / 12/7/98

TEST DATE: 08/05/1998

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty controller output (FC-IJ64)

Primary Effects:
Flow control valve (ND16) controller fails to output percentage selected by instructor.

With the malfunction activated to 0% (valve closed), note that the controller output is 0%, and that the CU FLOW annunciator on panel 3F alarms.

The following data was recorded on the 8 pen recorders:

T:FIJ13	RCU Demin Inlet Flow
XCNHIJ64	RCU Flow Controller Output
T:PIJ70	Pump Discharge Pressure

Discussion:

The RCU Flow controller is always operated in the manual mode and was in manual for this test.

Results:

During performance of the test, the FILTER FLOW LO alarm was received and the Cleanup System isolated. From previous discussions with plant operators, the reviewer determined that the cleanup Filter will sometimes go into hold on reducing flow conditions. The rate of flow decrease will determine whether the filter goes into hold or whether the low flow alarm is received. The simulator performance was acceptable. All other alarms activated as expected and no unexpected alarms were noted.

The SAR printer failed during this test. Alarms received were recorded by the test operator.

AVAILABLE OPTIONS:

(1) Flow controller output	0-100%
(2) Ramp time	0-14,400 seconds
(3) Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) RCU-8 RCU Flow control Valve Failure

(2) Flow controller output 0%

(3) Ramp time 30 seconds

(4) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power

FINAL TEST CONDITIONS:

Run Time: 20 Minutes

At the conclusion of this test, the malfunction has been cleared and the affected flow control valve has been verified as operable. The simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS49
14.6.43.7

TITLE: Partial/Total Failure of Control Room Annunciators

PREPARED BY/DATE: [signature] / 11/11/97

TEST DATE: 11/05/97

APPROVED BY/DATE: R Davidson / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Loss of annunciator lights due to contact failure in breaker at 125V DC Distribution Center E, circuits #1 and/or #5. Loss of audible horn and chime due to breaker failure at IP-4 circuit #13.

Primary Effects:
Total or partial loss of control room annunciator lights or loss of audible horn and chime.

MSC-7A DC-E Circuit 1
Annunciator lights and horn do not function on the following panels:

10XF	3F-E
10F	3F-F
1F/2F-B	3F-G
1F/2F-C	5F/6F-H
3F-D	5F/6F-J

MSC-7B DC-E Circuit 5
Annunciator lights and horn do not function on the following panels:

5F/6F-K	8F/9F-R
5F/6F-L	8F/9F-S
7F-M	8F/9F-T
7F-N	8F/9F-U
7F-P	9XF
7F-Q	12XR

MSC-7C IP-4 Circuit 13
All alarm windows will function normally except the horn and chime.

The test procedure checks each option for this malfunction by verifying that each alarm panel has the proper response to the malfunction. With the malfunction active, actions which cause an alarm on each panel are performed by the test personnel who then verify proper response (or lack of response). The annunciator test switches are also checked for each option.

☐

Results:

The annunciator failure malfunctions were found to work correctly. All steps in the procedure were completed.

☐

The Sequence of Alarms Recorder (SAR) printer was off during ☐ the test. The printout was therefore not attached.

AVAILABLE OPTIONS:

(1)	Loss of DC-E ckt 1	MSC-7A
	Loss of DC-E ckt 5	MSC-7B
	Loss of IP-4 ckt 13	MSC-7C
(2)	Delay time	0-28,800 seconds

OPTIONS TESTED:

All 3 options for this malfunction were tested.

Time delay: 0 sec.

INITIAL CONDITIONS FOR TEST:

IC 15, full power operation.

Record any annunciators lit prior to activation of the malfunction. Annunciators K-7-e and R-3-c were lit at the start of this test.

FINAL TEST CONDITIONS:

Run Time: 2 Hours

At the conclusion of this test, the annunciator malfunctions have been cleared. The test demonstrates that the annunciator malfunctions can be cleared and simulation continued.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

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□

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS50
14. 6. 7. 7.00

TITLE: Core Spray System Failure to Autostart

PREPARED BY/DATE: [signature] / 11/3/00

APPROVED BY/DATE: [signature] / 11/06/00

TEST DATE: 08/03/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF24	3.1.2(23)	Passive malfunctions in emergency systems

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Broken wire at actuation relay causes a designated Core Spray System autostart failure.

Failure of a single relay will not result in loss of any core spray due to the redundant initiation logic.

Failure of 16K101A and C will result in System I failure to actuate.

Failure of 16K101B and D will result in System II failure to actuate.

The following data was recorded on the trend recorders:

T:P43A	Sys 1 Core Spray Press
T:P43B	Sys 2 Core Spray Press
T:F27A	Sys I Core Spray Flow
T:F27B	Sys II Core Spray Flow

Results:

Two field changes were made to the procedure to substitute Trend Plots for Strip Charts and delete the step verifying the SYSTEM OVERPRESSURE alarm which was removed by a modification.

All steps in the procedure were completed with no discrepancies identified. All alarms expected by the procedure were received.

AVAILABLE OPTIONS:

(1) Failed relay:	CSS-7A	16K101A
	CSS-7B	16K101B
	CSS-7C	16K101C
	CSS-7D	16K101D
(2) Delay time	0 - 28,800 sec	

OPTIONS TESTED:

(1) CSS-7A and 7C

(2) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power

Initiate malfunction NSS-4A Recirc Loop Rupture (unisolable) at 100% severity.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the simulator is in a post accident condition with Core Spray System 1 failed and Core Spray System 2 running. The procedure states that the malfunction is not recoverable. The simulator, however is capable of continued simulation of recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS51
14.6.5.1

TITLE: ESW Pump Trip

PREPARED BY/DATE: [signature] / 10/27/98

APPROVED BY/DATE: R Davidson / 12/7/98

TEST DATE: 07/21/1998

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF8	3.1.2(6)	Loss of service or cooling water to individual components
MF24	3.1.2(23)	Passive malfunctions in emergency systems

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION

Malfunction Cause:
Motor ground develops tripping the 50 GS device, which in turn trips the motor breaker.

Test Actions and Primary Effects:
Start ESW pump 52A. Activate malfunction CNS-1A and note that the pump trips as indicated by the pump status lights, the pump ammeter indicates zero, and the dp for heat exchangers 50A and B goes to zero. The malfunction is then cleared and the pump restarted manually.

The procedure does not require recording of data.

Results:

One field change was made to the procedure to add instructor action to reset the motor overload.

All steps in the procedure were completed satisfactorily.

AVAILABLE OPTIONS:

(1) Pump to trip	CNS-1A ESW pump 52A
	CNS-1B ESW pump 52B
	CNS-1C ESW pump 52C
	CNS-1D ESW pump 52D
(2) Delay time	0-28,8000 sec.

OPTIONS TESTED:

(1) CNS-1A ESW pump 52A trips
(2) Delay time 0 sec

INITIAL CONDITIONS FOR TEST:

(1) Initialize to IC-65, Full Power
(2) Place Containment Spray System in Torus Cooling
(3) Start ESW pump 52A

FINAL TEST CONDITIONS:

Run Time: 17 Minutes

At the conclusion of this test, the malfunction has been cleared and the ESW pump was manually restarted. The simulator was capable of continued simulation, unaffected by the malfunction.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS52
14.6.5.4

TITLE: Containment Spray Pump Trip

PREPARED BY/DATE: E Young / 8/9/99

APPROVED BY/DATE: R Davidson / 11/30/99

TEST DATE: 08/05/1999

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF24 3.1.2(23) Passive malfunctions in emergency systems

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Faulty 52 UVD device.

Primary Effects:

Activate the LOCA malfunction to 100% and manually start Containment Spray. Activate malfunction CNS-4A. Note that CNS pump 51A trips by observing the pump status lights, and that containment spray system 1 flow goes to zero.

The following data was recorded on the 8 pen recorders:

T:PDP6A	dPI-IP06A HX-1-1
T:PDP6B	dPI-IP06B HX-1-2
T:T40B	Sys I HX Outlet Temp
T:F03A	Sys I flow FI-IP04A
T:PIP08	Drywell Pressure
T:TI42A	Torus Bulk Temperature
T:T40A	Sys I HX Inlet Temp
TSCNBA23	Reactor Building 23' Area Temp

Results:

The procedure states that following the pump trip, the Low Flow Annunciator, B-2-a, will come in and immediately clear. The low Flow alarm however, must be manually reset. This is the correct response.

All alarms and automatic actions expected in the procedure occurred.

AVAILABLE OPTIONS:

(1) Pump to trip	CNS-4A Cont Spray Pump 51A CNS-4B Cont Spray Pump 51B CNS-4C Cont Spray Pump 51C CNS-4D Cont Spray Pump 51D
(2) Delay time	0-28,800 secs.

OPTIONS TESTED:

(1) CNS-4A Containment Spray Pump 51A

(2) Delay time: 0 seconds

INITIAL CONDITIONS FOR TEST:

(1) Initialize to IC-65, Full Power

(2) Activate the LOCA NSS-4A to 100%

(3) Start Containment Spray System 1 in the Drywell Spray mode.

(4) After the Torus Spray valve opens, activate malfunction CNS-4A.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the malfunction has been cleared and the pump restarted. The plant is in a post LOCA condition with Core Spray cooling the core. The reactor coolant is exiting the reactor vessel and returning to the torus. The test was ended before decay heat decreased below the capacity of Containment Spray heat removal. The simulator was capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE
TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS53
14.6.9.3

TITLE: Emergency Diesel Generator Fails to Start

PREPARED BY/DATE: E M[illegible] / 10/28/98

TEST DATE: 09/15/1998

APPROVED BY/DATE: R Davidson / 12/7/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)
MF24	3.1.2(23)	Passive malfunctions in emergency systems

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Fuel Line Blockage

Primary Effects:
Loss of power to Bus 1C if auto start signal is low voltage on Bus 1C.

NOTE: System annunciators associated with equipment powered by 1C will alarm.

The following data was recorded on the 8 pen recorders:

EEDSC	BUS 1-C Voltage
ODGNM(1)	EDG 1 RPM (Freq.)
AEDSCM	4160V BUS 1-C current
AEDSA1MM	460V USS 1A1 current
AEDSA2MM	460V USS 1A2 current
AEDSA3MM	460V USS 1A3 current
ODGNPU(1)	EDG 1 Engine Speed

The Sequence of Alarms Recorder (SAR) printout was also attached.

Results:

All alarms and automatic actions occurred as expected and no unexpected alarms were recorded.

AVAILABLE OPTIONS:

(1) DGN-3A EDG1
    DGN-3B EDG2

(2) Delay time 0 - 28,800 seconds

OPTIONS TESTED:

(1) DGN-3A, #1 Diesel Generator

(2) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

From IC-61, 50% power:

(1) Select the following equipment to run:
RBCCW pump 1-1
TBCCW pump 1-1
CRD pump NC08A
Drywell fans RF1, RF2, RF3
Air compressor 1-1

(2) Open normal feed breaker 1C for Emergency Bus 1C after inserting malfunction.

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of this test, Bus 1-C is powered by Emergency Diesel Generator 1. All malfunctions are cleared and the simulator is capable of continued simulation. Recovery operations could be continued by the instructor if desired.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

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☐

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS54
14.6.30. 5

TITLE: Auto Scram Fails

PREPARED BY/DATE: [signature] / 7/24/97

TEST DATE: 07/14/97

APPROVED BY/DATE: [signature] / 12/15/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF13	3.1.2(11)	Loss of protective system channel
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF24	3.1.2(23)	Passive malfunctions in emergency systems
MF25	3.1.2(24)	Failure of the Automatic reactor trip system

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in

3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: K51(A) and K52(A) relay coils are "Hot Shorted" to the respective RPS power bus.

Primary Effects:
Any auto scram signal will not result in reactor scram.
Manual scram will still work.

The test is performed by placing an APRM drawer for an APRM in each protection system to the Standby position.

All associated parameter annunciators come in. White RPS solenoid status lights stay on. Rods do not move.

The procedure does not require automatic recording of data.

Results:
All steps in the procedure were completed. All expected alarms were received and no unanticipated alarms or actions were noted.

AVAILABLE OPTIONS:

Time Delay 0 - 28,800 seconds

The test operator may select any APRM in each protection system.

OPTIONS TESTED:

Delay time 0 seconds

APRM Channels 4 and 7 were selected.

INITIAL CONDITIONS FOR TEST:

(1) IC-15, Full Power.

(2) Initiate a Neutron Flux Scram by turning the Operate Switch to Standby on one APRM drawer for an APRM in Channel I (1 through 4) and on one APRM drawer for an APRM in Channel II (5 through 8) on panel 3R and 5R.

FINAL TEST CONDITIONS:

Run Time: 15 Minutes

At the conclusion of this test, the reactor has been manually scrammed, demonstrating that the automatic scram fails and that the manual scram still functions. No attempt is made to clear the malfunction since the reactor has scrammed.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

No simulator deficiencies were identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

NONE

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS55
14.6.40.8

TITLE: MPR Fails High/Low

PREPARED BY/DATE: SMay / 8/9/99

TEST DATE: 08/05/1999

APPROVED BY/DATE: R Danilson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures
MF26	3.1.2(25)	Reactor pressure control system failure (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in

limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: MPR failure.

The MPR setpoint will go the value selected by the instructor.

With malfunction TCS-8 activated to 112 psig, the control valves open to the 100% load position, and the bypass valves open as indicated by the valve status lights on panel 7F. The reactor pressure decreases until about 854 psig, at which point the MSIVs close and a reactor scram occurs.

The following data was recorded on the 8 pen recorders:

RTCSCV(1)	Control Valve No. 1 Position
RTCSCV(2)	No. 2
RTCSCV(3)	No. 3
RTCSCV(4)	No. 4
RTCSBV(1)	Bypass Valve No. 1 Position
RTCSBV(2)	No. 2
RTCSBV(3)	No. 3
RTCSBV(4)	No. 4
RTCSBV(5)	No. 5

RTCSBV(6)	No. 6
RTCSBV(7)	No. 7
RTCSBV(8)	No. 8
RTCSBV(9)	No. 9

T:PRE03A	Reactor Pressure
PTCSPSP	MPR Setpoint
SGENMWMT	Main Generator Load MWe

The Sequence of Alarms Recorder (SAR) printout was also attached.

Results:

All steps in the procedure were completed successfully. The procedure does not specify the alarms expected, but a review of the SAR indicates all alarms activated are appropriate for the event.

AVAILABLE OPTIONS:

(1) Pressure setpoint	112-1084 psig
(2) Ramp time	0-14,400 seconds
(3) Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) Activate to 112 PSIG

(2) Ramp time 120 seconds

(3) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

(1) IC-65, Full Power.

(2) Verify the EPR in control.

It was also previously noted that the Turbine Load Limit must be set at the High Speed Stop to allow full opening of the Control Valves.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the Reactor is scrammed and isolated. The simulator is capable of continued simulation of recovery events. The malfunction is recoverable and can be cleared by the instructor. Operator actions are possible using this malfunction, with different options, which could prevent a scram and isolation, thus allowing the scenario to continue along a different path.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS56
14.6.40.10

TITLE: EPR Fails High/Low

PREPARED BY/DATE: [signature] / 7/24/97

TEST DATE: 07/14/97

APPROVED BY/DATE: R Warrington / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures
MF26	3.1.2(25)	Reactor pressure control system failure (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in

3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: EPR failure.

The EPR setpoint will go to the value selected by the instructor.

With the MPR in control and malfunction TCS-10 activated to 890 psig, the EPR stroke increases until the EPR takes control. Steam Line pressure will decrease until steam chest pressure is about 890 psig.

The following data was recorded on the 8 pen recorders:

T:XAPRM3	APRM Channel 3
T:PPT1	30 inch Header Pressure
T:FSID75	Total Steam Flow
RTCSCV(1)	Control Valve Position
RTCSCV(2)	
RTCSCV(3)	
RTCSCV(4)	
RTCSBV(1)	Bypass Valve Position
RTCSBV(2)	
RTCSBV(3)	
T:PTID45	Reactor Pressure
PTCSEPSP	EPR Setpoint
SMSS	Generator Load

The SAR alarm printout was also attached.

Results:

No alarms were identified as expected in the procedure. Several alarms actuated, primarily associated with improved dynamic response of the Feedwater Heaters since the last test.

The Turbine Control System (TCS) responded properly, opening the control valves and 1 bypass valve fully, and 1 bypass valve partially. The reactor pressure and power responded correctly, with the pressure dropping, the bypass valves closing, and the control valves returning to near the original position.

The malfunction was then cleared and control returned to the EPR by manual operation of the pressure regulator controls.

When this test was last performed in 1993, the reactor power and pressure response were not correct. The response has significantly improved since that test.

AVAILABLE OPTIONS:

(1) Pressure setpoint	890-1010 psig
(2) Ramp time	0-14,400 seconds
(3) Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) Activate pressure to 890 psig

(2) Ramp time 30 seconds

(3) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

(1) IC-15, Full Power.

(2) Place the MPR in control.

(3) Set EPR to 930 psig.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the malfunction has been cleared and pressure control returned to the EPR. The plant conditions are essentially returned to the starting point and the simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS57
14.6.40.6

TITLE: Any Turbine Bypass Valve Fails

PREPARED BY/DATE: ~~SMay~~ / 9/16/98

TEST DATE: 09/15/1998

APPROVED BY/DATE: R Danielson / 12/7/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF26	3.1.2(25)	Reactor pressure control system failure (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause:	Valve sticks open:	Sticking pilot valve.
	Valve ramps closed:	Leaking servo motor.
	Valve ramps open:	Pilot leaking by.

Primary Effects:
The selected bypass valve will go to the position selected by the instructor.

For a severity of 100% from full power:
The bypass valve opens as indicated by the valve position indicator and the valve status lights on panel 7F and 13R. The control valves close down to compensate. Control and bypass valve position changes are seen on recorder on 14R.

The following data was recorded on the 8 pen recorders:

WCNDBV(1)	Bypass Valve Flow Condenser A
T:FSID75	Total Steam Flow
RTCSCV(1)	Control Valve Position
RTCSCV(2)	" " "
RTCSCV(3)	" " "
RTCSCV(4)	" " "
RTCSBV(1)	Bypass Valve No. 1 Position
T:FID38A	Steam Flow Loop A
T:FID38B	Steam Flow Loop B
SMSS	Generator Load

T:PEDPT1	Reheat Steam Flow 1st stage Right (1-1)
T:PEDPT2	Reheat Steam Flow 1st stage Left (1-3)

The Sequence of Alarms Recorder (SAR) printout was also attached.

Results:
All steps in the procedure were completed satisfactorily. No alarms were identified as expected in the test procedure. Two alarms were received which were not identified in the procedure. The APRM Hi and Rod Block alarms often come in when steam flow is changed. These alarms are appropriate for the test.

AVAILABLE OPTIONS:

(1) Bypass valve to fail	TCS-6A BPV #1 TCS-6B BPV #2 TCS-6C BPV #3 TCS-6D BPV #4 TCS-6E BPV #5 TCS-6F BPV #6 TCS-6G BPV #7 TCS-6H BPV #8 TCS-6J BPV #9
(2) Failure position	0-100% (100% = open)
(3) Ramp time	0-14,400 seconds
(4) Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) TCS-6A, BPV #1

(2) Failure position: 100% open

(3) Ramp time: 60 seconds

(4) Delay time: 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the malfunction has been cleared and the plant returned to the approximate starting condition. The simulator is capable of continued simulation, unaffected by the malfunction.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

There were no problems identified during this test.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

NONE

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS58
14. 6.14. 1.00

TITLE: Loss of Extraction Steam to Feedwater Heaters

PREPARED BY/DATE: [signature] / 11/6/00

APPROVED BY/DATE: Adam H. Mersey / 11/07/00

TEST DATE: 08/04/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: The wire to the solenoid breaks causing the solenoid to de-energize, closing the reverse flow check valve.

The reverse flow check valve closure causes a loss of extraction steam to the feedwater heaters.

Primary Effects:
REVERSE FLOW CK VLV TRIP alarm will come on.

The associated moisture removal valve will open causing "MRV OPEN" alarm.

Heater level will decrease. HP A3 LEVEL HI/LO annunciator will alarm.

Loss of heating steam will cause feedwater temperature to decrease and power to increase.

The following data was recorded on the Instructor Station Trends:

T:TE17	HP heater 1-A-3 Outlet Temp. (TR-13R05,PT18)
T:TI47	Feedwater Temp indicator (TI-47)
SNISAAVG(1)	APRM channel 1
T:LIA12	Wide Range Reactor Level

Results:

Four field changes were made to the procedure to correct a recorder ID number, remove V-1-0088 malfunction (no longer applicable), add steps for verifying proper alarms, and use of the utility display to follow power level.

All alarms and automatic actions identified in the procedure actuated as expected.

The transient induced was rather mild due to the design characteristics of the plant. When the extraction steam valve is closed, a substantial steam flow to the heater occurs from the header connecting the two main flash tanks and the three high pressure heaters. The feedwater temperature decreases about 6 degrees. The power increase (Neutron Flux) was approximately 2%.

AVAILABLE OPTIONS:

(1) Failed valve	FWH-1A	V-1-87 (1A2)
	FWH-1B	V-1-88 (1A3)
	FWH-1C	V-1-89 (1B2)
	FWH-1D	V-1-90 (1B3)
	FWH-1E	V-1-91 (1C2)
	FWH-1F	V-1-92 (1C3)
(2) Delay time	0 - 28,800 seconds	

OPTIONS TESTED:

(1) FWH-1B, V-1-88 (1A3)

(2) Time delay: 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 6 Minutes

At the conclusion of this test, the malfunction has been cleared, and the Heater Extraction Non-Return valve has reopened. The Main Flash Tank Hi/Lo Level alarm continued to alarm. The test was terminated before this level alarm cleared permanently. All equipment returned to the pretest condition and the simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS60
14.6.45.22

TITLE: Turbine Trip Without Bypass

PREPARED BY/DATE: [signature] / 12/2/97

APPROVED BY/DATE: R Davidson / 12/16/97

TEST DATE: 11/10/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF17	3.1.2(15)	Turbine trip
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF20	3.1.2(19)	Reactor trip
MF26	3.1.2(25)	Reactor pressure control system failure (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the

limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

This procedure is used to certify that the simulator response to a turbine trip without bypass is acceptable.

The test is performed by executing a drill file on the instructor station. The drill file includes all required data collection.

Plots of simulator parameters were made using the validation test program. Not all plots were printed.

Reactor Thermal	SRXSTOTL
Feedwater Flow	T:FSID75
Steam Flow	T:FFID75
Reactor Dome Pressure (NR)	T:PTID45

Reactor Dome Pressure (WR)	T:PID76
30 Inch Header Pressure	T:PNSSTN(23)
Reactor Level (WR)	T:LIA12
Reactor Level (NR)	T:LID59A
Turbine Steam Flow	T:PID09
Bypass Valve Flow	WNSSTK(95)
Feed Water Temperature	T:TI47
Total Recirc Flow	T:FIA72C
Recirculation Loop Temperatures	T:TE31A,C,E,G,J

Results:

One field change was made to the test procedure to correct the drill file.

The Reactor pressure peaked at approximately 1148 psig, well below the lowest safety valve setpoint. The Neutron Flux peaked at approximately 118%, approximately the same as the last test.

All automatic actions and alarms occurred as expected, including:

- Anticipatory Scram
- Recirc Pump ATWOS Trip
- EMRV Operation
- Isolation Condenser Initiation

All acceptance criteria of the test procedure were satisfied.

This test was also run (no data collection) using a Middle of Life (MOL) IC. The results of the MOL test were very similar to the EOL test. Since the EOL pressurization transients should be more severe than the BOL or MOL transients, a TR was written to increase the decay heat in the End of Life core. This TR is not related to this procedure.

AVAILABLE OPTIONS:

There are no options available for this test.

OPTIONS TESTED:

There are no options available for this test.

INITIAL CONDITIONS FOR TEST:

The test was performed from IC-30, Full Power, Cycle 15 Core, End of Life (EOL).

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of the test, the reactor has scrammed from the turbine trip. The bypass valves remain failed in the closed position. The simulator is capable of continued simulation of recovery operations but the instructor must clear the active malfunctions and overrides.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains applicable acceptance criteria.

This is an FSAR analyzed event. FSAR analyses normally are based on worst case conditions and assumptions. Simulator performance and actual plant performance may be less severe.

The test results were also compared to the previous run of this test performed in 1995 as part of the Cycle 15 Core Load modification.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS61
14.6.25.1

TITLE: Reactor Recirculation Pump Seizure

PREPARED BY/DATE: John Solakiewicz / 8/17/00

APPROVED BY/DATE: Adam H. Teesey 8/21/00

TEST DATE: 08/16/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS (MF 6)

3.1.2(4) Loss of forced coolant flow due to single or multiple pump failure

ANS 3.5 APPENDIX A REQUIREMENTS (A 4)

A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Pump hydraulic bearing failure.

Reactor recirculation pump seizes.

(1) Pump vibration alarm annunciates due to increased vibration in pump immediately preceding pump seizure.

(2) M-G set for affected pump annunciator alarm:
Drive Motor Breaker Trip,
Drive Motor Breaker Lockout.

(3) Pump indication for affected pump.
Indicated pump Delta P decreases then increases due to reverse Delta P.
Pump flow decreases then reverses direction.

(4) Total Recirc Flow recorder indicates decrease in total recirc flow then returns to approximately the initial value.

TEST DESCRIPTIOM (cont.)

(5) Effected MG motor amps peg up scale then drop to zero when breaker trips.

(6) Reactor power decreases approximately 15 percent.

(7) Generator output decreases in relation to the decrease in reactor power.

(8) Recirc pump indication on bench board 4F changes state.

(9) The affected MG-set voltage and current decrease on panel 3F.

The following data was recorded using the Instructor Station Trends datapool:

T:PIA07	Total core Delta P on Recorder IA08 (red pen)
T:FIA72D	Total Recirc flow on recorder IA08 (green pen)
T:PIA50C	Recirc Pump C dp
T:FA60C1	Recirc Pump C flow

Results:

Field changes were made to the procedure to substitute Trends for Strip Chart Recording and reflect the test of C pump.

A field change was made due to the reactor level swing of approximately four inches; the procedure anticipated 12 to 14 inches. This is acceptable since the simulator/plant were upgraded with digital feedwater control which better controls level transients.

The final power level was 22% below the initial level, but the procedure anticipated a final 7% power reduction. This was found acceptable due to loss of the pumping capacity (20%) and losses due to reverse flow through the now idle pump. (Reserve pumping capacity of the 4 running pumps was not utilized.)

All automatic actions and alarms occurred as expected.

AVAILABLE OPTIONS:

(1) RCP to seize	RCP-1A	Pump A
	RCP-1B	Pump B
	RCP-1C	Pump C
	RCP-1D	Pump D
	RCP-1E	Pump E
(2) Delay time	0-28,800 seconds	

OPTIONS TESTED:

(1) RCP-1C, Pump C

(2) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the reactor is operating at reduced power with one recirc pump seized. The malfunction is not recoverable but the simulator is capable of continued simulation of recovery actions and operation with 1 pump idle. IC reset is required to restore the pump to operation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS62
14.6.25.7

TITLE: Recirc Pump Shaft Shear

PREPARED BY/DATE: [signature] / 11/11/97

TEST DATE: 11/05/97

APPROVED BY/DATE: R Davidson / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF6	3.1.2(4)	Loss of forced coolant flow due to single or multiple pump failure

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those

expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Shaft failure.

Primary Effects:
The shaft of the selected pump will shear, separating the pump from the motor, causing the following indications:

(1) PUMP DELTA P LO A annunciator E-1-d alarms.
(2) Indicated pump DELTA P decreases then increases and pump flow decreases and then increases due to reverse flow.
(3) MG Set A motor amps decrease to a no load value.
(4) Total recirc flow recorder indicates a decrease in total recirc flow.
(5) Reactor power decreases to a lower value on all APRM recorders.
(6) Reactor level will increase approx. 6 inches in 1 minute then decrease approx. 3 inches over the next 3 minutes.
(7) Total core dp on recorder IA08 will decrease.

The following data was recorded on the 8 pen recorders:

T:PIA07	Total core Delta P on recorder IA08 (DPIT-IA07, red pen)
T:FIA72C	Total recirc flow on recorder IA08 (FT-IA60A, B, C, D, E green pen)
T:FIA60A	Loop A Flow
RRWMIX(2)	Total Core Flow
T:PIA50A	Recirc Pump A delta P
SNISAPRM	Core Neutron Power
T:LID59A	Reactor Level (GEMAC)
T:PID76A	Reactor Pressure Narrow range

The Sequence of Alarms Recorder (SAR) printout was also attached.

Results:

One Field Change was made to the procedure to correct a monitored variable.

All Annunciators identified in the procedure activated. Additional Annunciators for MS Drain Tanks, Feedwater Heaters, and Flash Tank Level were received and found acceptable.

The Reactor level response differed from that expected in the procedure. The increase was 4 inches with the level returning to normal in approximately 1 minute. This was found to be acceptable.

The total indicated recirc. flow decreased as stated in the

procedure but increased to slightly below the starting value. Since reverse flow in a loop is added in the summer as forward flow, this is the correct response.

The core delta P decrease was slightly less than predicted in the procedure. This was also found to be acceptable.

AVAILABLE OPTIONS:

(1) RCP to shear shaft	RCP-7A Pump A RCP-7B Pump B RCP-7C Pump C RCP-7D Pump D RCP-7E Pump E
(2) Delay time	0-28,800 seconds

OPTIONS TESTED:

(1) RCP-7A, Pump A

(2) Delay time 0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 60 Minutes

At the conclusion of this test, the pump shaft is still sheared. The simulator is capable of continued simulation should the instructor wish to continue recovery from this event. The shaft shear is not recoverable, requiring IC Reset to clear the malfunction.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS64
14.6.45.22

TITLE: Uncontrolled Rod Withdrawal at Power

PREPARED BY/DATE: [signature] / 10/6/99

TEST DATE: 09/13/1999

APPROVED BY/DATE: R Davidson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF14	3.1.2(12)	Control Rod Failure (stuck, uncoupled, drift, drop, & misaligned)
MF29	Spec. 2.3	Abnormal (excessive) control rod worth

ANS 3.5 APPENDIX A REQUIREMENTS

A3	A3.2(2)	Ability to operate with similar plant operating procedures
A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance

criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

This test is used to certify that the simulator will cause a Rod Block during a rod withdrawal error (Operator Error) at full power under the various APRM operability states without exceeding the MCPR limit.

Starting from full power with a limiting control rod pattern (MCPR of >90%), a maximum worth rod is continuously withdrawn until a Rod Block occurs. Core calculations are then performed to verify that the safety limit is not exceeded.

Results:

All steps in the procedure were completed successfully.

The Initial, interim, and final core conditions were calculated using the stimulated Power Shape Monitoring System (PSMS). The color printer failed during the test. Core information was manually recorded from the PSMS screen. The SAR printout was also attached to the test results.

AVAILABLE OPTIONS:

There are no options available for this test.

OPTIONS TESTED:

There are no options available for this test.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

FINAL TEST CONDITIONS:

Run Time: 90 Minutes

At the conclusion of the test, the reactor is operating closer to all thermal limits with some Nuclear Instrumentation bypassed. The simulator reactor controls may be manipulated to return to the starting conditions should the instructor desire to do so.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains applicable acceptance criteria.

The stimulated Plant Computer System (PCS) was used to collect and evaluate the test data. The initial and final thermal limits were recorded using the stimulated PSMS.

This event is analyzed in FSAR Update section 15.4.2. FSAR analyses normally consider worst case conditions, with more severe consequences than expected in the plant or on the simulator.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS65
14. 6.45.23.00

TITLE: Improper Startup of an Inactive Recirc Loop at 100 degrees F

PREPARED BY/DATE: John Solakiewicz / 9/14/00

TEST DATE: 09/13/2000

APPROVED BY/DATE: Adam H. Harvey / 10/10/00

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

N/A

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely,

simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.□C□

TEST DESCRIPTION:

This test is used to verify that the simulator will cause a high neutron flux scram when a cold, inactive recirculation loop is returned to service at rated power.

The FSAR Update analysis assumed a 100 degree F loop water temperature. Since this is not possible with the drywell temperature at ~130 degrees per normal plant conditions, the test is performed from a ~130 degree loop temperature. In addition, the FSAR assumes that the discharge bypass valve is opened at the same time as the suction valve. To prevent cold water flow into the core during the 2 minutes it takes to open the suction valve, the discharge bypass is opened after the suction valve. This is also required for the pump motor start sequence.

The tested condition is initiated manually following established plant procedures for start-up of an idle recirculation loop. A Computer Aided Exercise Program file contains the data collection requirements.

The initial condition was established by isolating the recirc loop and repeatedly setting the recirc pipe wall temperature to a low value to cool the water in the loop.

Primary Effects:
When an idle recirc pump with its loop cooled to 130 F is started, the cold water injection causes a High Neutron Flux (APRM) scram at 116% Power. While recirc flow continues to increase, a APRM Hi-Hi condition also causes an additional scram signal.

Results:

Several field changes were made to account for the installation of DFRCS (Digital Feedwater and Recirculation Control System) and using plant procedures for idling and restarting recirculation pumps. The changes include substituting test personnel actions for actions previously performed using overrides. Other changes included better prerequisites for setting initial conditions.

The High Flux scram occurred as expected but the APRM Flow Converter scrams did not occur.

The event on the simulator appears more dynamic than the FSAR evaluation. In particular, the FSAR plot shows little increase in recirculation flow. Starting the idle pump, however, with digital recirculation control an increase recirc flow, as observed on the simulator, should be seen.

The Temple Graph data was collected, plotted and printed.

The event described in the FSAR is not realistic and could not

be duplicated in its entirety.

AVAILABLE OPTIONS:

There are no options available for this test.

□C□

OPTIONS TESTED:

There are no options available for this test.

□C□

INITIAL CONDITIONS FOR TEST:

IC-17 100% power was created for this test. Then the cooled recirculation loop was created for this test, using and the isolated and cooled down "D" Recirculation Loop.

Recirculation Loop "D" is isolated and cooled to approximately 150 degrees F by artificial means which can only be done on the simulator. The loop was isolated and the pipe metal temperature repeatedly set to a low value to cool the loop. A macro file was generated to perform this coolinig process. The normal process of allowing Drywell ambient conditions to cool the loop would have taken over 33 hours to model. The metal cooling process took around 5 hours to accomplish cooldown to the 130 degree goal (temperature in the range of the Drywell ambient).

□C□

FINAL TEST CONDITIONS:

Run Time: 8 Hours.

At the conclusion of this test, the reactor has scrammed and isolated. The simulator is capable of continued simulation of recovery operations.

The simulator passed this test, based that it scrammed on high neutron flux.

□C□

BASELINE DATA USED TO EVALUATE
TEST RESULTS:

The test procedure contains applicable acceptance criteria.

This event is analyzed in FSAR Update, section 15.4.4. FSAR analysis results are normally more severe than expected plant or simulator response.

□C□

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

The data collection file (Drill51) was found not to agree with the written test procedure. Changes were made on the spot (pen and ink) to conform the test to the procedure. Also changes were made to the procedure prerequisites to better allow for modeling this test the next time it is performed.

□C□

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS66
14.6.45.24

TITLE: Recirc Flow Controller Malfunction

PREPARED BY/DATE: SM / 11/11/97

TEST DATE: 11/04/97

APPROVED BY/DATE: RWanilson / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

This test is used to certify that the simulator responds correctly to recirculation Flow Controller malfunction as described in the FSAR Update, Section 15.4.5.

Primary Effects:

With the simulator operating at approximately 53.5% power and Recirculation Flow at approximately 42%, an individual recirculation m/a controller is failed to 100% setting causing maximum scoop tube rate of change.
The affected recirculation pump speeds up to 57.5 hz. and flow increases to 39500 gpm.

A CAEP file is used to initiate this transient from the instructor station. The CAEP file contains the data collection requirements.

Results:

Since installation of Digital Recirc Flow Control, there is no malfunction to initiate this event. The drill file has been changed to increase the pump speed by putting the scoop tube in local manual control and ramping its position using LOAs.

Plots of Individual Recirc Pump Flows, Reactor Power Level, Feedwater Flow, and Steam Flow were attached.

The test procedure does not specify any expected alarms. Review of the SAR alarms indicates that the APRM Hi, Rod Block, and Recirc Pump C Lo Differential Pressure alarms were received. These alarms are proper for this event.

The simulator met the procedure acceptance criteria of recirc flow increase to ~40000 gpm and reactor power stabilizing at a higher level with no scram.
This test was compared to Updated FSAR data in which the flow increase occurred in 8 seconds. The test was run with a 60 second flow ramp time, a more realistic rate for the flow increase.

AVAILABLE OPTIONS:

This procedure has no available test options because it is intended to closely match the FSAR event.

OPTIONS TESTED:

There are no test options available .

INITIAL CONDITIONS FOR TEST:

An IC with the following characteristics has been created for this test:

1. Reactor power 1032 MWt (53.5%)
2. Recirculation Flow 6.7E4 gpm (42%)
3. Middle of Life/Equilibrium Xenon

4. All automatic controls in automatic

This IC was stored in IC-18

FINAL TEST CONDITIONS:

Run Time: 3 Hours

At the conclusion of this test, the LOAs used to initiate the recirc flow increase is still active. The simulator is capable of continued simulation. The LOAs can be cleared, allowing the instructor to continue recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains applicable acceptance criteria.

FSAR event 15.4.5 was used to prepare and to evaluate this test.
FSAR analyses normally consider worst case conditions. The actual plant and the simulator response may be less severe than the FSAR results.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

While attempting to perform this test, the recirc MG Set scoop tube was moved to the 100% position with no ramp time. The Recirc Pump tripped on overload and somehow caused less of TBCCW with resultant generator runback, loss of air, and scram. A TR was issued but the test is considered as passed with no TR.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS67
14. 6.44. 3.00

TITLE: ATWS (Failure to Scram, Turbine Trip w/o Bypass)

PREPARED BY/DATE: [signature] / 11/6/00

TEST DATE: 10/20/2000

APPROVED BY/DATE: Adam H. [signature] / 11/14/00

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF13	3.1.2(11)	Loss of protective system channel
MF15	3.1.2(13)	Inability to drive rods
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures
MF24	3.1.2(23)	Passive malfunctions in emergency systems
MF25	3.1.2(24)	Failure of the Automatic reactor trip system
MF26	3.1.2(25)	Reactor pressure control system failure (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The turbine trips on loss of vacuum due to a ruptured exhaust boot on "B" main condenser. Fused contacts on relays K21A, K51, and K52 cause RPS failure to scram. The Alternate Rod Injection (ARI) System fails.

The turbine trip and bypass valves are interlocked closed. The Reactor Protection system fails to insert control rods. Automatic, manual and Alternate Rod Injection do not function. This places a severe pressure transient on the reactor.

Condenser vacuum decreases rapidly to zero as indicated on Panel 5F/6F. The Turbine trips with attendant indications and Alarms. The turbine bypass valves may open momentarily, but close instantly as indicated on panel 7F.

Reactor Pressure increases rapidly as indicated on panel 5F/6F. A reactor scram does not occur as indicated by unchanged rod positions on panel 4F and rapidly increasing reactor power. The ARI System does not function.

Safety Valves and all EMRV's open as indicated by the acoustic monitors. Drywell pressure and temperature increase because of safety valve actuation.

ATWS Division I and II actuate and all five recirculation pumps trip. Both Isolation Condensers initiate. Torus level and temperature increase.

As pressure and power decrease, EMRV's begin to close.

The procedure calls for recording a considerable amount of data on the Analog Graphic Trending Recorders and the Line printer. The Line Printer data, however, was not recorded.

The SAR alarm printout is attached.

Results:

Eight field changes were made to the procedure to correct the Malfunction and LOA Identification numbers which changed due to modifications. Changes also account for the reduction of Safety Valves. Changes were made to allow the use of the trend charts versus the troublesome strip chart recorders.

As expected, the reactor did not scram and the Alternate Rod Injection system failed. Reactor pressure increased, opening the safety and relief valves. Reactor high pressure initiated both Isolation Condensers and tripped all five recirculation pumps reducing reactor power to approximately 40%. Since the expected operator action of manually opening any cycling relief valves is not performed in this test, they caused pressure and power swings consistent with relief valve operation.

Late in the test, the Standby Liquid Control System (SLC) is manually initiated.

All other automatic actions occurred as expected. All expected alarms were received and no unwarranted alarms actuated.

AVAILABLE OPTIONS:

This test procedure uses a combination of malfunctions and uses no options.

OPTIONS TESTED:

There are no options for this procedure.

INITIAL CONDITIONS FOR TEST:

Initialize the Simulator to IC-15, Full Power.
The initial conditions were then developed and captured in IC-197.

Malfunction RPS-5 was activated to prevent an Automatic Scram.

LOA-CAS-20 was activated to prevent ARI initiation

The following Malfunctions were selected and activated.
(1) CFW-17, Main Condenser Air In-leakage
(2) Severity-100%
(3) Delay - 0 seconds

When the Torus temperature increased to 110 degrees F, the standby liquid control system was activated on panel 4F.

FINAL TEST CONDITIONS:

Run Time: 1 Hour, 30 Minutes

At the conclusion of this test, the reactor has failed to scram, the recirc pumps have tripped, and Boron is being pumped into the reactor using the Standby Liquid Control System. Reactor power level is cycling due to EMRV operation, but is trending down. The Core Spray system, initiated by Hi Drywell Pressure, is operating. However, reactor pressure is too high for injection. The simulator is capable of continuing the recovery activities. IC reset is required to resume normal operations since unrecoverable actions have occurred.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS68
14.6.44.1

TITLE: Loss of All AC Power

PREPARED BY/DATE: [signature] / 9/17/98

TEST DATE: 09/15/1998

APPROVED BY/DATE: R Davidson / 12/7/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;

b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause:
Main Generator trips due to a faulty 86 G relay actuation. S1A is out of service for relay testing and Diesel Generator 1 is out of service for maintenance. S1B fails to close in due to a faulty NORMAL AFTER TRIP switch contact. Diesel Generator 2 fails to auto close due to an electrical fault on 1D Bus.

Primary Effects:
Generator trips offline, startup transformers fail to close in causing loss of off site power. Emergency Diesel Generators will not be able to assume any load. This places the plant in a blackout condition. The reactor scrams and isolates. Instruments and loads supplied by CIP-3 remain operable due to shifting the rotary inverter to its DC motor. The Isolation Condensers initiate to control pressure following the scram and isolation. The DC Emergency Bearing Oil Pump and the Emergency Seal Oil Pump start.

The following DATA was recorded using DP Screen Print:

JGEN86G	86G Relay Status
JBKS1A	S1A Breaker Status
JBKS1B	S1B Breaker Status
JBKDG1	DG1 Breaker Status
JBKDG2	DG2 Breaker Status
JBKC	1C Breaker Status

JBKD	1D Breaker Status
EEDSC	4160 Bus 1C Volts
EEDSD	4160 Bus 1D Volts
EEDSCIP3	CIP-3 Volts
EEDSVLD	VLDP 1 Volts
RNR108A	EMRV A Position
RNR108B	EMRV B Position
RNR108C	EMRV C Position
RNR108D	EMRV D Position
RNR108E	EMRV E Position
PCASIPT3	Instrument Air Pressure
T:PIP08	Drywell Pressure
T:T102C	Drywell Temperature
T:TI42A	Torus Temperature
EEDSPMG1	RPS System 1 Volts
OEDSPSP1	RPS System 1 Frequency
EEDSPMG2	RPS System 2 Volts
OEDSPSP2	RPS System 2 Frequency
AEDSBTAM	125VDC Batt A Amps
VEDSQAM	125VDC Batt A Volts
AEDSBTBM	125VDC Batt B Amps
VEDSQBM	125VDC Batt B Volts
AEDSBTCM	125VDC Batt C Amps
VEDSBTCM	125VDC Batt C Volts

The following data was recorded on the 8 pen recorders:

T:PIA92A	Reactor Pressure (Wide Range)
T:PTID45	Reactor Pressure (Narrow Range)
T:LID59A	Reactor Water Level A
T:LIA12	Reactor Water Level B
T:FIA72C	Total Recirc Flow
SNISAPRM	Reactor Power (MWth)
T:FSID75	Total Steam Flow
T:FFID75	Total Feed Flow
* LNSSMPA	Fuel Zone Level A
* LNSSMPB	Fuel Zone Level B

* Data was not recorded due to recorder failure.

The Sequence of Alarms (SAR) Printout was also attached.

Results:

All alarms identified in the procedure were received. Additional alarms noted in the SAR review were found to be appropriate. The control Room normal lighting went off as expected. And the emergency lights came on. Minor corrections to the battery operated emergency lights were identified previously.

All automatic actions occurred as expected.

AVAILABLE OPTIONS:

This procedure uses a combination of several malfunctions and Local Operator Actions to achieve a loss of AC power. There are no options given in the test procedure.

OPTIONS TESTED:

There are no options available for this test procedure.

INITIAL CONDITIONS FOR TEST:

(1) Initialize the Simulator to IC-15, Full Power.

(2) Set LOA EDS-250, Breaker S1A 69 Permissive Switch to Trip. This will remove S1A from service

(3) Set LOA DGN-3, DG-1 Local Mode Switch to 0. This will remove DG1 from service

(4) Activate malfunction EDS-13B. This will prevent S1B breaker from closing

(5) Activate malfunction EDS-2B, Bus Fault. This will put a fault on Bus 1D

After setting up the above conditions, initiate the transient by activating malfunction GEN-1, Generator Trip, with no delay time.

FINAL TEST CONDITIONS:

Run Time: 2 Hours

At the conclusion of this test, the reactor remains isolated. All AC power except CIP-3 is deenergized. The procedure states that this malfunction is not recoverable and the test is terminated without commencing recovery operations. The simulator, however is capable of continued simulation and recovery is possible by clearing malfunctions and performing LOAs.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS69
14. 8. 1. 0.00

TITLE: Manual Reactor Trip

PREPARED BY/DATE: John Soldwedel / 11/6/00

APPROVED BY/DATE: Adam H. Thrasy / 11/07/00

TEST DATE: 10/06/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T1 Manual Scram

REQUIRED MALFUNCTIONS

MF20 3.1.2(19) Reactor trip

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

TP1 B1.2.1 Transient test parameter set TP1 required at 0.5 seconds:

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Wide Range Reactor Pressure
Narrow Range Reactor Pressure
Wide Range Reactor Water Level
Narrow Range Reactor Water Level (FW Control)
Generator Gross Electrical Power
Turbine Steam Flow
Total Core Flow
Total Recirculation Loop Flow

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to prove that the simulator meets the acceptance criteria of ANS 3.5 - 1985, Section 4.2 for the Manual Reactor Scram transient evaluated by the EPRI Best Estimate Thermal Analysis Package on 10/26/89.

The Manual Reactor Scram transient was predicted by a RELAP5 analysis using the following initial conditions. The reactor was at steady state full power (1930 MWth) with recirculation flow at 61.0E6 lbm/hr (16E4 gpm). Reactor steam dome pressure was 1020 psig and reactor level was controlled at 162 inches.

All control systems were in automatic.

A Drill File (Drill1) was prepared to initiate the transient using Switch Override and automatically collect the required data.

Using the Validation Test Program (VTP), comparison plots of simulator data versus RELAP5 Best Estimate data were prepared for the following parameters:

Plant Parameter	Simulator Variable
Reactor Power % Flux	SNISAPRM
*Total Recirculation Flow	WNSSTKRT
Total Steam Flow	WNSSTKST
Total Feedwater Flow	WNSSTKFT
Reactor Dome Pressure (NARROW)	T:PTID45
Reactor Dome Pressure (WIDE)	T:PIA92A
Reactor Water Level (WIDE)	T:LIA12
Reactor Water Level (YARWAY)	T:LRE21A
Reactor Water Level (NARROW)	T:LID59A
Steam Header Pressure	RRPRESS(32)
Turbine Steam Flow	WMSSNSS
Bypass Valve Steam Flow	WNSSTK(95)
**Turbine Steam Flow(GROSS MWe)	SGENMWMT

Not all of the VTP plots were printed.

* For this transient Total core Flow is equivalent to Total Recirculation Flow. Therefore, total Core Flow is not plotted.

**RELAP5 does not calculate Gross MWe. Turbine Steam Flow will be compared to simulated MWE for validation purposes.

Results:

All alarms and automatic actions occurred as expected. No unexpected alarms were received. Comparison with the Relap5 data showed very good correlation. Two parameters behaved differently on the simulator, but were determined to be problems in the Relap5 analysis. Simulator performance appears to be more accurate. The simulator pressure decreased causing a steam line low pressure MSIV closure and resultant lower steam header pressure. The simulator reactor water level decreased further than the Relap5 analysis. Both are known problems in Relap5 results.

AVAILABLE OPTIONS:

There are no options in this test procedure.

OPTIONS TESTED:

There are no options in this test procedure.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power Operation.

Adjust recirculation flow, control rods per the pull sheets and other controls as necessary to achieve the following plant conditions:

Reactor Power	1930 MWth	
Recirculation Flow	16.0E4gpm	
Reactor Pressure	1020 psig	
Reactor Level	160"	(Set at 163.5)

FW A and C Block Valve Switches in Open.

The above condition was stored in IC-10.

Previous testing used a lower recirculation flow, which is beyond the current administrative limit. IC-10 was used to more closely replicate the Relap5 initial conditions.

FINAL TEST CONDITIONS:

Run Time: 180 Minutes

At the conclusion of this test, the reactor has scrammed and isolated. No operator action has been taken in response to the scram. The simulator is capable of continued simulation. The switch override used to simulate operator activation of the manual scram push buttons must be cleared before the scram can be reset. No malfunctions were activated.

The simulator passed this test.

Simulator pressures followed the Relap5 code and were within 50 psig in the narrow range and 20 psig in the wide range.

The bypass valve openings for the simulator vs. Relap5 appear similar in total volume. However, the simulator has one large valve opening whereas Relap5 has multiple small openings.

Reactor levels are within 10 inches of each other at the lowest point of the scram and return to similar levels. The simulator is about one minute slower than the Relap5 analysis over this period.

Results (cont'd)

Recirculation flow differs. The simulator's digital recirculation controls are very steady and did not vary for this test. Relap5 shows flow changes after the trip, but then steadily decreases.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

Reference data is the RELAP5, Best Estimate Analysis, OC R2P, Manual Scram (BE-01) dated 10/26/89. (OCS-5378)

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

A meeting was held in 1992 with the person responsible for performing the Relap5 analysis to discuss to differences noted. A letter was provided to document the known Relap5 deficiencies.

The DFCS was installed on the simulator since the RELAP5 analysis. Actual changes in post scram level control are not available for comparison to the simulator.

The results were also compared to the test performed in 1999.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS70
14. 8. 2. 0.00

TITLE: Simultaneous Trip of All Feedwater Pumps

PREPARED BY/DATE: John Sakamura / 11/3/00

APPROVED BY/DATE: Adam H. Maney / 11/26/00

TEST DATE: 10/11/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T2 Simultaneous trip of all Feedwater pumps

REQUIRED MALFUNCTIONS

MF11	3.1.2(9)	Loss of normal feedwater or normal feedwater system failure
MF12	3.1.2(10)	Loss of all feedwater (normal and emergency)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

TP1	B1.2.1	Transient test parameter set TP1 required at 0.5 seconds:

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Wide Range Reactor Pressure
Narrow Range Reactor Pressure
Wide Range Reactor Water Level
Narrow Range Reactor Water Level (FW Control)
Generator Gross Electrical Power
Turbine Steam Flow
Total Core Flow
Total Recirculation Loop Flow

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to prove that the simulator meets the acceptance criteria of ANS 3.5 -1985, Section 4.2 for the Loss of Feedwater Transient evaluated by the EPRI Best Estimate Thermal Analysis Package, dated October 30, 1989.

The loss of feedwater transient was predicted by a RELAP5 analysis using the following initial conditions:
The reactor was at steady state:
   full power (1930 MWth)
   recirculation flow at 16.0E4 gpm
   Reactor (dome) pressure at 1035 psia (1020 psig) and
   reactor level controlled at 162 inches.

All control systems were in automatic and no operator actions were required.

The following data was collected:

Plant parameter	Simulator Variable
Reactor Power % Flux	SNISAPRM
*Total Recirculation Flow	WNSSTKRT
Recirculation Loop B Temp.	T:TE31C
Recirculation Loop D Temp.	T:TE31G
Total Steam Flow	WNSSTKST
Total Feedwater Flow	WNSSTKFT
Reactor Dome Pressure	T:PTID45
Reactor Water Level (Wide)	T:LIA12
Reactor Water Level (GMAC)	T:LID59A
Reactor Water Level (Yarway)	T:LRE21A
Turbine Steam Flow	WMSSNSS
Bypass Valve Steam Flow	WNSSTK(95)

*For this transient Total core Flow is equivalent to Total Recirculation Flow.

The test is run using a drill file which inserts malfunctions and operator actions automatically based on time or parameter conditions. Data is automatically recorded into a file for plotting using the instructor station. This method of performing the test assures repeatable performance.

Results:

All alarms identified in the procedure were received and no unwarranted alarms were received. All automatic actions occurred as expected for Lo and Lo Lo Water Level conditions.

Comparison of the simulator response to Relap calculations shows good agreement for most parameters:

Rx Power
Recirc Flow
Core Voids (middle)
Recirc Water Temps
Steam Flow.

The reference data shows two Bypass valves opened, while the simulator had one open with the equivalent flow.
The Relap5 data shows an increase in reactor downcomer level at approximately 175 seconds that does not appear on the simulator. In addition, the rate of reactor depressurization (cooldown) in the Relap results was much slower than the simulator. Steam header pressure better followed the Relap results. Both of these differences were previously evaluated and it was determined that the simulator response was more accurate.

AVAILABLE OPTIONS:

There are no options available for this test.

OPTIONS TESTED:

There are no options available for this test.

INITIAL CONDITIONS FOR TEST:

IC-15 - 100% Power, Cycle 15 Core (snapped to IC 10 for testing) once conditions were established. Higher recirculation flow was used than is currently administratively allowed.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the reactor has scrammed and isolated and ECCS systems have started from the Lo Lo Level signal. Core Spray injection has not yet started since Reactor Pressure is well above 300psi. The simulator is capable of continued simulation should the instructor need to do so.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

RELAP5 Best Estimate Analysis, OC R2P, LOFW WITH LL LVL S/P 90" - dated 10/30/89. (OCS-5377)

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

A meeting was held in 1992 with the person responsible for performing the Relap5 analyses. The differences in level and cooldown response were discussed. Inaccuracies in the Relap analysis were identified and documented in a letter in the test file.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS71
14. 8. 3. 0.00

TITLE: Simultaneous Closure of All MSIVs

PREPARED BY/DATE: John Salakus 11/7/00

TEST DATE: 09/27/2000

APPROVED BY/DATE: Adam H. Marz 11/07/00

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T3 Simultaneous closure of all MSIVs

REQUIRED MALFUNCTIONS

N/A

ANS 3.5 APPENDIX A REQUIREMENTS

N/A

ANS 3.5 APPENDIX B REQUIREMENTS

TP1 B1.2.1 Transient test parameter set TP1 required at 0.5 seconds:

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Wide Range Reactor Pressure
Narrow Range Reactor Pressure
Wide Range Reactor Water Level
Narrow Range Reactor Water Level (FW Control)
Generator Gross Electrical Power
Turbine Steam Flow
Total Core Flow
Total Recirculation Loop Flow

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to prove that the simulator meets the acceptance criteria of ANS 3.5 - 1985, Section 4.2 for the Simultaneous Closure of All Main Steam Isolation Valves Transient evaluated by the EPRI Best Estimate Thermal Analysis Package on November 30, 1989.

The MSIV closure transient was predicted by a RELAP5 analysis using the following initial conditions. The reactor was at steady state full power (1930 MWTH) with recirculation flow at 61.0 E6 lbm/hr (16E4 gpm). Reactor steam dome pressure was 1035 psia (1020 psig) and reactor level was controlled at approximately 162 inches.

All control systems were in automatic and no operator actions were required.

Using the Validation Test Program (VTP), comparison plots of simulator data versus RELAP5 Best Estimate data were prepared for the following parameters:

Plant Parameter	Simulator Variable
Reactor Power (APRM AVG)	SNISAPRM
Generator Electric Power	SGENMWMT
Total Steam Flow	WNSSTKST
Total Feedwater Flow	WNSSTKFT
Wide Range Reactor Pressure	T:PIA92A
Narrow Range Reactor Water Level (GEMAC)	T:LID59A
Total Recirculation Loop Flow	WNSSTKRT
B Recirc. Temp	T:TE31C
D Recirc. Temp	T:TE31G
TOTAL EMRV STEAM Flow	WNSSTK(74)
TOTAL EMRV STEAM Flow	WNSSTK(73)

Not all plots were printed. The SAR alarm printout is attached.

Results:

All alarms and automatic actions specified in the procedure occurred.

When compared to the Relap5 data, the simulator minimum reactor water level was lower. Only two EMRV's opened to control pressure on the simulator. Three EMRV's were predicted to open in the Relap5 analysis. Reactor pressure has to be above 1080psig for additional EMRV's to open.

Results (cont'd)
A meeting was held in 1992 with the person responsible for the Relap calculations to evaluate the differences. It was determined that the reactor level response on the simulator was more realistic than the Relap results. A letter discussing the differences is attached to the test procedure. The reviewer found the identified differences acceptable.

AVAILABLE OPTIONS:

There are no options available in this test procedure.

OPTIONS TESTED:

There are no options available in this test procedure.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power Operation.

Adjust recirculation flow, control rods per the pull sheets and other controls as necessary to achieve the following conditions:

Reactor Power	1930 MWth
Recirculation Flow	16.0E4 gpm
Reactor Pressure	1020 psig
Reactor level	162" (Set at 163.5)

After establishing the conditions, a test IC was established as IC-198.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, The MSIVs are closed by switch override, and the reactor has scrammed. The simulator is capable of continued simulation of recovery operations, but the MSIV closure override must be reset from the instructor station.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

OC Replica simulator Transient Test Data Simultaneous closure of All Main Steam Isolation Valves November 30, 1989.

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

A letter from the individual responsible for performing the Relap calculations is attached to the procedure.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS72
14. 8. 4. 0.00

TITLE: Simultaneous Trip of All Five Recirc Pumps

PREPARED BY/DATE: John Salakewicz, 11/7/00

TEST DATE: 07/26/2000

APPROVED BY/DATE: Adam H. Murray 11/07/00

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T4 Simultaneous trip of all recirc. pumps

REQUIRED MALFUNCTIONS

MF6 3.1.2(4) Loss of forced coolant flow due to single or multiple pump failure

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

TP2 B1.2.2 Transient test parameter set TP2 required at 0.5 seconds:

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Narrow Range Reactor Pressure
Narrow Range Reactor Water Level (FW Control)
Total Core Flow
Individual Recirculation Loop Flows
Individual Calibrated Jet Pump Flows (N/A for Oyster Creek)

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to prove that the simulator meets the acceptance criteria of ANS 3.5 - 1985, Section 4.2 for the Simultaneous Trip of All Five Recirculation Pumps Transient evaluated by the EPRI Best Estimate Thermal Analysis Package on March 21, 1990.

The Five Pump Trip transient was predicted by a RELAP5 analysis using the following initial conditions. The reactor was at steady state hot full power (1930 MWth) with recirculation flow at 61.OE6 lbm/hr. (16E4gpm). Reactor steam dome pressure was 1020 psig and reactor level was controlled at approximately 164 inches.

All control systems were in automatic and no operator actions were required.

The predicted downcomer level swell in the RELAP5 analysis is thought to be excessive. The turbine trip setpoint of 175" probably would not have been exceeded had the transient analysis started from 160".

Using the Validation Test Program (VTP), prepare comparison plots of simulator data versus RELAP5 Best Estimate data for the following parameters:

Plant Parameter	Simulator Variable
*Reactor Power (%neutron flux)	SNISAPRM
*Total Steam Flow	WNSSTKST
*Total Feedwater Flow	WNSSTKFT
*Narrow Range Reactor Pressure	T:PTID45
*Reactor Water Level(narrow GEMAC)	T:LID59A
*Total Recirculation Flow(Core Flow)	T:FIA72D
*Recirculation Flow A	T:FIA60A
*Recirculation Flow B	T:FIA60B
*Recirculation Flow C	T:FIA60C
*Recirculation Flow D	T:FIA60D
*Recirculation Flow E	T:FIA60E

*ANS 3.5 required

The SAR alarm printout was also attached.

Results:

All five recirc pumps tripped simultaneously. The coast down and final recirculation flow were close to that predicted by the Relap5 analysis. The level swell caused by the pump trip was lower than that predicted by Relap5 but errors were found in the Relap data. It is believed that the simulator response is correct for the conditions tested.

All alarms called for in the test procedure were received. Other alarms received and are being listed in the test procedure. No unwarranted alarms were received.

AVAILABLE OPTIONS:

No options are available.

OPTIONS TESTED:

Since this test is designed to duplicate a Relap5 analyzed transient, no options are available.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power Operation,

Adjust recirculation flow, control rods per the pull sheets and other controls as necessary to achieve the following conditions:

Reactor Power 1930 MWth
Recirculation Flow 16E4 gpm
Reactor Pressure 1020 psig
Reactor Level 160"

After the adjustments were made, the conditions were stored in temporary IC-48.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the reactor is operating on natural circulation flow. The malfunctions used are recoverable and the simulator is capable of continuing recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

O.C. Replica simulator Transient Test Data Simultaneous Trip of All Five Recirculation Pumps, March 21, 1990 (RELAP5 Data).

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

Results were also compared to the test performed in 1998.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS73
14. 8. 5. 0.00

TITLE: Single Recirc Pump Trip (LER 50-219 87-09)

PREPARED BY/DATE: John Salakous / 9/29/00

APPROVED BY/DATE: Adam H. Mursey / 10/10/00

TEST DATE: 07/24/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T5 Single recirc. pump trip

REQUIRED MALFUNCTIONS

MF6 3.1.2(4) Loss of forced coolant flow due to single or multiple pump failure

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

TP2 B1.2.2 Transient test parameter set TP2 required at 0.5 seconds:

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Narrow Range Reactor Pressure
Narrow Range Reactor Water Level (FW Control)
Total Core Flow
Individual Recirculation Loop Flows
Individual Calibrated Jet Pump Flows (N/A for Oyster Creek)

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to prove that the simulator meets the acceptance criteria of ANS 3.5 - 1985, Section 4.2 for the transient evaluated in Licensee Event Report 50-219-87-09.

On February 7, 1987 a loss of generator field on the "B" Recirculation Pump M/G Set caused the "B" Recirculation Pump coast down and stop. No trip alarms were received.

Control room operators noticed a decrease in main generator output and reactor power of approximately 10% on the APRM's. Recirculation flow in the operating loops increased due to lower core delta pressure and reverse flow in the B recirculation loop. Loop B indicated flow was significantly less than the other four loops.

After stable operation in this mode for approximately 45 minutes the "B" Recirculation Pump discharge valve was closed causing "B" Recirculation Loop flow indication to decrease to zero, total recirculation flow indication to decrease, and core delta pressure and reactor power to increase.

This test will deviate from the actual plant event in that the operator action of increasing recirculation flow slightly will not be performed.

The length of time between pump trip and discharge valve closure is also compressed. The malfunction used is a Recirc Pump Trip which causes annunciators to actuate that did not alarm in the plant event because an under voltage device failed to trip.

The test is executed using a Computer Aided Exercise File.

Using the Validation Test Program (VTP), prepare comparison plots of simulator data versus plant data for the following parameters:

Plant Parameter	Simulator Variable
Total Recirculation Flow	T:FIA72D
Recirculation Flow A	T:FIA60A
Recirculation Flow B	T:FIA60B
Recirculation Flow C	T:FIA60C
Recirculation Flow D	T:FIA60D
Recirculation Flow E	T:FIA60E
Steam Flow Line A	T:FID33A
Steam Flow Line B	T:FID33B
Feed Flow	T:F42201
Reactor Level A (GMAC)	T:LID59A
Reactor Pressure (Narrow)	T:PTID45
Reactor Neutron Power APRM 1	T:XAPRM1

The Sequence of Alarms (SAR) printout was attached. This test is performed using Drill File #5 so that results can be made consistent between annual tests.

Results:

Some of the reference data was plotted using the Temple Graph Print function. Simulator data is attached.

All alarms and automatic actions occurred as expected.

All simulator parameters compared well with the actual plant data.

The results were also compared to the previous test results.

AVAILABLE OPTIONS:

This test is written to duplicate an actual event in the plant and therefore has no options available.

OPTIONS TESTED:

No options are available for this test.

INITIAL CONDITIONS FOR TEST:

Starting from IC-15, full Power, a special test IC was stored as IC-34 with the following conditions:

Reactor Power	1868MWt (97%)
Recirculation flow	153,600 gpm
Reactor Pressure	1020 psig
Reactor level	159"

FINAL TEST CONDITIONS:

Run Time: 1.5 Hour

At the conclusion of this test, the B Recirc pump is idle with the discharge valve closed. The malfunction is still active. The simulator is capable of continued operation. The instructor must clear the malfunction if the B pump is to be restarted.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

Historical Data Package "Loss of 'B' Recirc. Pump 2/7/87" (OCS-4940) Note: Includes LER 50-219 87-09.

Historical Data Package "Recirculation Pump 'B' Trip 2/7/87" (OCS-4941)

The test procedure contains the expected response of the simulator in the Detailed Plant Response section. The Historical Data Package was used to compare plant and simulator data.

The test results were also compared to the 1999 results.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS74
14. 8. 6. 0.00

TITLE: Main Turbine Trip from Low Power - No Anticipatory Scram

PREPARED BY/DATE: [signature] / 11/16/00

APPROVED BY/DATE: Adam H. Kerz / 11/16/00

TEST DATE: 09/27/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T6 Turbine trip at maximum power w/o immediate SCRAM

REQUIRED MALFUNCTIONS

MF17 3.1.2(15) Turbine trip

ANS 3.5 APPENDIX A REQUIREMENTS

A4 A3.4 Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

TP1 B1.2.1 Transient test parameter set TP1 required at 0.5 seconds:

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Wide Range Reactor Pressure
Narrow Range Reactor Pressure
Wide Range Reactor Water Level
Narrow Range Reactor Water Level (FW Control)
Generator Gross Electrical Power
Turbine Steam Flow
Total Core Flow
Total Recirculation Loop Flow

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to prove that the simulator meets the acceptance criteria of ANS 3.5 - 1985, Section 4.2 for the Turbine Trip from 40% Power Transient evaluated by the EPRI Best Estimate Thermal Analysis Package on March 23, 1990. However, changes to the Turbine Trip pressure switches caused this test to be run at a power level of 26% to yield the same results.

The Turbine Trip Transient for 40% of rated power was predicted by a RELAP5 analysis using the following initial conditions.

Recirculation flow was approximately 10.7E4gpm. Control rods were adjusted to achieve 26% rated neutron flux (501 MWth). Feedwater and steam flows were approximately 26% (825 lbm/sec, ~1.7E6 lbm/hr). Reactor level was controlled at 162 inches and reactor pressure was at approximately 1000 psig.

At this load, the second stage reheaters were assumed to be out of service (V-1-21, V-1-34, PRV2-R and PRV2-L all closed).

All control systems were assumed to be in automatic and no operator actions were assumed. A turbine trip was then initiated.

Using the Validation Test Program (VTP) comparison plots of simulation data versus RELAP5 Best Estimate data for the following parameters were prepared.

Plant Parameter	Simulator Variable
*Reactor Power (%Neutron Flux)	SNISAPRM
*Total Feedwater Flow	WNSSTKFT
*Wide Range Reactor Pressure	T:PIA92A
*Narrow Range Reactor Pressure	T:PTID45
*Narrow Range Reactor Water Level(GEMAC)	T:LID59A
*Wide Range Reactor Water Level	T:LIA12
*Turbine Steam Flow	WMSSNSS
Bypass Valve Steam Flow	WNSSTK(95)
*Total Recirculation Loop Flow	WNSSTKRT
Core Void Fraction (Top)	VNSSAM(12)

* ANS 3.5 Appendix B Parameters

Results:

All automatic actions and alarms occurred as expected during the test. No unwarranted alarms were received. Comparison to the reference data is difficult since the initial conditions and the plant response differ significantly due to modifications installed (Digital Feedwater, PSH Setpoint, Generator Protection).

AVAILABLE OPTIONS:

This test is written to duplicate a specific RELAP5 analysis and therefore has no options.

OPTIONS TESTED:

There are no options for this test.

INITIAL CONDITIONS FOR TEST:

IC 196 was established for the test with the following Conditions.

Reactor Power 501 MWth 26% on APRM's
Recirculation Flow 10.7E4 gpm
Reactor Pressure 1000 psig
Reactor Level (Yarway) 163"
Second Stage Reheaters OFF
Turbine Steam Flow approx. 1.7E6 lbm/hr

This test was previously performed at 810MWt, 40% Power. With the present Turbine PSH setpoint, the Turbine Trip Scram is now bypassed below 26% power.

FINAL TEST CONDITIONS:

Run Time: 1.5 Hours

At the conclusion of this test, the turbine is tripped and the reactor remains in operation with steam passing through the bypass valves which are approximately 60% open. Feedwater temperature has decreased causing an increase in reactor power. The simulator is capable of continued simulation should the instructor wish to continue recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

O.C. Replica simulator Transient Test Data Turbine Trip from 40% Power, March 23, 1990

The reference data is of limited use because of modifications installed on the plant and simulator since the analysis was performed.

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

The results were also compared to the 1998 test results.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS75
14. 8. 7. 0.00

TITLE: Max Rate Power Ramp from 100% to 75% and Back to 100%

PREPARED BY/DATE: John S. Walkney / 11/7/00

TEST DATE: 09/27/2000

APPROVED BY/DATE: Adam H. Terzy / 11/07/00

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T7 Maximum rate power ramp with recirc flow from 100% to 75% and back to 100%

REQUIRED MALFUNCTIONS

N/A

ANS 3.5 APPENDIX A REQUIREMENTS

N/A

ANS 3.5 APPENDIX B REQUIREMENTS

TP1 B1.2.1 Transient test parameter set TP1 required at 0.5 seconds:

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Wide Range Reactor Pressure
Narrow Range Reactor Pressure
Wide Range Reactor Water Level
Narrow Range Reactor Water Level (FW Control)
Generator Gross Electrical Power
Turbine Steam Flow
Total Core Flow
Total Recirculation Loop Flow

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to prove that the simulator meets the acceptance criteria of ANS 3.5 - 1985, Section 4.2 for the Maximum Rate Power Ramp from 100% to 75% to 100% Transient evaluated by a RETRAN_03 Best Estimate Thermal Analysis on February 9, 1990.

The power ramp transient was predicted by a RETRAN_03 analysis using the following initial conditions. Reactor power was 1930 MW th with recirculation flow at 57.2E6 lbm/hr (15.5E4gpm). Reactor steam dome pressure was 1020 psig and reactor level was 162 inches.

In the analysis, the Recirculation flow demand setpoint was decreased in a step change to the demand corresponding to 75% power. Limiters in the recirculation flow control system then control the flow (power) reduction to 15.9% per minute, resulting in reaching 75% power in about 90 to 100 seconds. At 110 seconds, the recirculation flow demand was step changed back to the original flow demand setpoint.

The test was performed on the simulator by manually adjusting the master recirc flow controller setpoint to the setting required to obtain the desired flow.

Using the Validation Test Program (VTP), comparison plots of simulator data versus RETRAN_03 Best Estimate were prepared for selected parameters.

The following parameters were recorded:

Plant Parameter	Simulator Variable
*Reactor Power (%neutron flux)	SNISAPRM
*Total Steam Flow	WNSSTKST
*Total Feedwater Flow	WNSSTKFT
*Wide Range Pressure	T:PIA92A
*Narrow Range Pressure	T:PTID45
*Wide Range Reactor Water Level(GMAC)	T:LIA12
*Narrow Range Reactor Water Level(GMAC)	T:LID59A
*Generator Gross Electrical Power	SGENMWMT
*Turbine Steam Flow	WMSSNSS
*Total Recirculation Loop Flow	WNSSTKRT

*ANS 3.5_1985 required.

Additional parameters, including void fractions and recirculation pump speeds were recorded.

The SAR alarm printout was also attached.

Results:

As expected, the reactor scrammed on High Neutron Flux during the ramp back up to 100%. The maximum ramp rate settings of the Master Recirc Flow Controller are sufficient to cause a scram.

All steps in the procedure were completed. Expected alarms are not detailed in the procedure. The alarms received are primarily associated with Feedwater Heaters and Reheaters as well as with the reactor scram. They were found to be appropriate.

AVAILABLE OPTIONS:

This procedure is written to duplicate an analysis performed using Retran and therefore has no options.

OPTIONS TESTED:

The test procedure has no options.

INITIAL CONDITIONS FOR TEST:

IC-65, Cycle 15 Core, MOL, Full Power Operation. Adjusted recirculation flow, positioned control rods in accordance with the pull sheets, and used other controls (EPR) as necessary to achieve the following conditions:

Reactor Power	1930 MWt
Recirculation flow	15.5E4 gpm
Reactor Pressure	1020 psig
Reactor Level	160"

The condition was stored as temporary IC-197.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the reactor has scrammed and the turbine has tripped. The simulator is capable of continued simulation of recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

O.C. Replica simulator Transient Test Data Maximum Rate Power Ramp from 100% to 75% to 100%, February 9, 1990 (RETRAN_03) was used as the original baseline for this test. This test was compared to the 1998 test.

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS76
14. 8. 8. 0.00

TITLE: LOCA with Loss of Offsite Power

PREPARED BY/DATE: 11/14/00

TEST DATE: 10/05/2000

APPROVED BY/DATE: 11/14/00

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T8 Maximum size Reactor Coolant System Rupture with loss of offsite power

REQUIRED MALFUNCTIONS

MF1	3.1.2(1)(b)	LOCA inside & outside containment
MF2	3.1.2(1)(c)	Large & small reactor coolant breaks, including demonstration of saturated conditions
MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

TP3 B1.2.3 Transient test parameter set TP3 required at 0.5 seconds:

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Wide Range Reactor Pressure
Wide Range Reactor Water Level
Fuel Zone Water Level
Containment Temperature
Suppression Pool Temperature
Containment Pressure
Drywell Temperature
Drywell Pressure
Total Low Pressure Injection Flow
Total Low Pressure Core Spray Flow
Total High Pressure Injection Flow

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to demonstrate that the simulator meets the acceptance criteria of ANS 3.5 - 1985, Section 4.2 for the Maximum Size Reactor Coolant System Rupture with Loss of All Offsite Power Accident evaluated by the EPRI Best Estimate Thermal Analysis Package on December 7, 1989 (for NSSS Response) and (for containment Response) by the CONTEMPT code on March 23, 1990.

The Nuclear Steam supply system (NSS) response to the LOCA transient was predicted by a RELAP5 analysis with the following initial conditions.

The reactor was at steady state full power (1930 MWth) with recirculation flow at 61.OE6 lbm/hr (16E4gpm). Reactor steam dome pressure was 1035 psia (1020 psig) and reactor level was controlled at 162 inches. The initial liquid mass in the reactor vessel and recirculation loops was 427,000 lbm in the analysis.

There are differences between the simulation and the analysis.

1. The break location of the RELAP5 analysis is on the lower plenum side of the flow venturi while the simulator break location is on the pump/valve side of the flow venturi. Therefore, break flows will be different.

2. In the RELAP5 analysis the containment volume is assumed to be infinite and pressure is constant at 14.7 psia (atmospheric). The simulator calculates containment pressure.

3. Core spray flow occurs instantaneously at 32 seconds (10 seconds for diesel startup and 22 seconds for valve opening stroke time). The simulator has a dynamic flow calculation.

These differences are expected to have an insignificant effect on the general behavior of responses between the simulation and analysis.

Since the break location in the RELAP5 analysis is on a loop with no other connections (ICS, SDC, RCU) the 'D' Recirculation Loop LOCA Malfunction was used for the simulation. Also, the RELAP5 analysis assumed that Core Spray System 2 has only a Core Spray Pump available. Therefore operation of Core Spray Booster Pumps B and D was inhibited in the simulation.

Test Description (cont'd)
The RELAP5 results were used as input to the containment response code, CONTEMPT, with Primary containment at the following initial conditions.

Drywell Pressure	1.3 psig
Drywell Temperature	135 degrees F
Torus Pressure	0.001 psig
Torus Water Temp.	70 degrees F
Torus Water Level	12.5 feet
Oxygen Concentration	N/A %

An extensive set of variables (66) were collected automatically by the drill file which also executed the required actions. Selected variables were plotted against the reference data for comparison.

The SAR alarm printout was also attached.

Results:

All alarms and automatic actions identified in the procedure occurred.

Comparison of simulator data to predicted data shows good correlation. Because of the rapid rate of change of containment parameters, there are some large differences between simulator values and those predicted in the procedure for a specific time. These differences are not significant. In addition, the Containment Spray Auto Start feature was removed by a modification. The containment response is therefore different.

As was noted during previous tests, the simulator fuel clad temperature is significantly lower than the analysis. This was previously evaluated and found to be acceptable.

AVAILABLE OPTIONS:

There are no options available in this test procedure.

OPTIONS TESTED:

There are no options in this test.

INITIAL CONDITIONS FOR TEST:

The Simulator was initialized to IC-15, full Power Operation, Cycle 15 Core.

Adjustments were made to recirculation flow, control rods (per the pull sheets)
and other controls as necessary to achieve the following conditions.

Reactor Power	1930 MWt
Recirculation Flow	16E4 gpm
Reactor Pressure	1020 psig
Reactor Level	160 inches
Drywell Pressure	1.3 psig
Drywell Temperature (Bulk)	135 degrees F
Torus Pressure	0.001 psig
Torus Water Temperature	70 degrees
Torus Water Level	150 in.

After the adjustments were completed IC-10 was shot.

FINAL TEST CONDITIONS:

Run Time: 3 Hours

At the conclusion of this test, the Recirc Line Break has been isolated by closing the loop valves. The Reactor Level has recovered due to Core Spray flow. The Recirc. loop remains broken by an unrecoverable malfunction. The simulator is capable of continued simulation of recovery activities.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

OC Replica Simulator Transient Test Data Maximum Size Reactor Coolant System Rupture with loss of Offsite Power: NSSS Response December 7, 1989 (OCS-5091) (RELAP5)

OC Replica simulator Transient Test Data maximum Size Reactor coolant system Rupture with Loss of Offsite Power: PCN Response March 23, 1990 (OCS-5207) (Contempt)

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

The containment response from the above Contempt code is not applicable after the Containment Spray system starts since the auto start has been removed from both the plant and the simulator.

The results were also compared to the test performed last year.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS77
14. 8. 9. 0.00

TITLE: Max Size Unisolable Main Steam Line Rupture

PREPARED BY/DATE: [signature] / 11/11/00

APPROVED BY/DATE: Adam H. [signature] / 11/14/00

TEST DATE: 09/29/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T9	Maximum size unisolable mainsteam line rupture

REQUIRED MALFUNCTIONS

MF1	3.1.2(1)(b)	LOCA inside & outside containment
MF2	3.1.2(1)(c)	Large & small reactor coolant breaks, including demonstration of saturated conditions
MF21	3.1.2(20)	Main steam and main feed line breaks (inside & outside)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

TP3 B1.2.3 Transient test parameter set TP3 required at 0.5 seconds.

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Wide Range Reactor Pressure
Wide Range Reactor Water Level
Fuel Zone Water Level
Containment Temperature
Suppression Pool Temperature
Containment Pressure
Drywell Temperature
Drywell Pressure
Total Low Pressure Injection Flow
Total Low Pressure Core Spray Flow
Total High Pressure Injection Flow

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to prove that the simulator meets the acceptance criteria of ANS3.5 - 1985, Section 4.2 for the Maximum Size Unisolable Main Steam Line Rupture transient evaluated by the EPRI Best Estimate Thermal Analysis Package on February 9, 1990 for the NSSS response plus CONTEMPT code and on May 8, 1990 for the Primary Containment response.

The Maximum Size Unisolable Main Steam Line Rupture transient was predicted by RELAP5 and CONTEMPT analyses using the following initial conditions. The reactor was at steady state hot full power (1930 MWth) with recirculation flow at 61.0E6 lbm/hr (16E4gpm). Reactor steam dome pressure was 1020 psig and reactor level was controlled at 162 inches.

The following assumptions/limitations are part of this RELAP5 analysis.

1. The break location was at the Main Steam Line nozzle, upstream of the flow element, corresponding to Malfunction NSS17.

2. The containment is assumed to be of infinite volume and constant ambient pressure (steam at 14.7psia).

3. The core region level measured the collapsed liquid level from the bottom of the core to the top of the steam dome. The level so calculated should have the same trend as the fuel zone level instruments. It is not an accurate representation, particularly for this transient which causes liquid to be carried into the steam dome. The actual fuel zone level instruments only measure level into the moisture separators. They are insensitive to liquid carry over into the vessel dome.

The RELAP5 results are used as input to CONTEMPT to evaluate primary containment response. The primary containment initial conditions were as follows.

Drywell Pressure	1.3psig
Drywell Temperature	135 degrees F
Torus Pressure	0 psig
Torus Water Temp.	70 degrees F
Torus Water Level	12.6 feet

Test Description (cont'd)

Using the Validation Test Program (VTP), prepare selected comparison plots of simulator data versus RELAP5 Best Estimate data for the following parameters:

Plant Parameter	Simulator Variable
*Reactor Power (%neutron flux)	SNISAPRM
*Wide Range Pressure	T:PIA92A
*Wide Range Water Level	T:LIA12
*Fuel Zone Water Level	LNSSMPA
*Total Steam Flow	WNSSTKST
*Total Feedwater Flow	WNSSTKFT
*Torus Pressure	T:PIP12
*Torus Temperature	T:TI43A
*Drywell Pressure	T:PIP08
*Drywell Temperature (Bulk)	TPCNDVB
*Core Spray System I Flow	T:F27A
*Core Spray System II Flow	T:F27B
*Total Low Pressure Injection Flow	(Exception)
*Total High Pres. Injection Flow (CRD)	WCRDRD15
Total Recirculation Flow	WNSSTKRT
Recirculation Temp. A	T:TE31A
Recirculation Temp. B	T:TE31C
Recirculation Temp. C	T:TE31E
Recirculation Temp. D	T:TE31G
Recirculation Temp. E	T:TE31J
Steam flow A...B	RRWMIX(30),(31)
Feedwater Temperature	T:TI47
MS Header Pressure (30")	RRPRESS(32)
Fuel Centerline Temperature	RRTFUEL(4)
Clad Temperature	RRTCLAD(4)
Moderator Temperature	RRTBULK(6)
Core Void Fraction (Top)	RRVOID(10)
Core Void Fraction (Middle)	RRVOID(6)
Core Void Fraction (Bottom)	RRVOID(3)
RV Liquid Mass	RRMLVES(1)
RV Total Fluid Mass	RRMVES(1)
Isolation Condenser A...B Steam Flow	RRWMIX((33),(36)
Isolation condenser A...B Return Flow	RRWMIX(35),(38)
Containment Spray System I Flow	T:F03A
Containment Spray System II Flow	T:F03B
Break Steam Flow (Nozzle)	RRWBREA(1)
DW/Torus Vent Flow	WPCNV
Torus Water Level	T:LP09A
Rx DOWNCOMER Collapsed LVL	RRLEVABS

*ANSI/ANS 3.5 - 1985 required.

Results:

The reference data from the FSAR was also accumulated for test evaluation.

The procedure was completed with all alarms and automatic actions occurring.

AVAILABLE OPTIONS:

There are no options in this test procedure since it is written to perform the required maximum size break. The malfunction used has instructor selected severity, ramp time, and delay time. The severity selected was the maximum size (double ended guillotine break of 200%). No ramp or delay times were used.

OPTIONS TESTED:

This test uses a drill file which calls for a steamline break malfunction at 200% severity with no ramp or delay time.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power Operation was initialized. Several hours were expended to create the initial conditions used in the reference test as shown below.

Recirculation flow was adjusted per procedure (though the test flow rate is beyond plant administrative controls). Control rods were operated per the plant's pull sheets. Other controls were manipulated as necessary to achieve the following conditions.

Reactor Power	1930 MWt
Recirculation flow	16.0E4 GPM
Reactor Pressure	1020 psig
Reactor Level	160 inches
Drywell Pressure	1.30 psig
Drywell Temperature (Bulk)	135 degrees F
Torus Pressure	0.001 psig
Torus Water Temperature	70 degrees F
Torus Water Level	150 inches

FINAL TEST CONDITIONS:

Run Time: 2 Hours

At the conclusion of this test, the reactor and containment have isolated, but the steam line rupture is not isolated from the containment. The steam line rupture is not recoverable. An IC reset would be required for continued simulation. The capability to continue simulation of recovery events was not evaluated.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

O.C. Replica simulator Transient Data, maximum size Unisolable Main Steam Line Rupture, September, 1990 (RELAP5 & CONTEMPT)

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

A meeting was held in 1992 with the individual responsible for the Relap5 calculations. It was pointed out that there are large uncertainties in the level response of the Relap5 calculations, particularly in predicting the plant instrument response. Additionally, the plants ROPS and recently installed Digital Feedwater Control System respond quicker to level changes compared to the equipment in the time period of the reference test.

The test results were also compared to the results of the 1998 and 1999 tests.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS78
14. 8.10. 0.00

TITLE: Sim. Closure of All MSIVs/Stuck Open EMRV, IC Fails, Loss of FW

PREPARED BY/DATE: John Solakiewicz / 11/10/00

TEST DATE: 10/06/2000

APPROVED BY/DATE: Adrian H. Maresz / 11/10/00

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

T10	Simultaneous closure of all MSIVs with a single stuck open Relief valve

REQUIRED MALFUNCTIONS

MF3	3.1.1(2)(d)	Failure of safety and relief valves (LOCA)
MF11	3.1.2(9)	Loss of normal feedwater or normal feedwater system failure
MF12	3.1.2(10)	Loss of all feedwater (normal and emergency)
MF24	3.1.2(23)	Passive malfunctions in emergency systems

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

TP3	B1.2.3	Transient test parameter set TP3 required at 0.5 seconds:

Reactor Power (% Neutron Flux)
Total Steam Flow
Total Feedwater Flow
Wide Range Reactor Pressure
Wide Range Reactor Water Level

TP3 B1.2.3 Transient test parameter set TP3 required at 0.5 seconds:

Fuel Zone Water Level
Containment Temperature
Suppression Pool Temperature
Containment Pressure
Drywell Temperature
Drywell Pressure
Total Low Pressure Injection Flow
Total Low Pressure Core Spray Flow
Total High Pressure Injection Flow

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

The purpose of this test procedure is to prove that the simulator meets the acceptance criteria of ANS 3.5 - 1985, Section 4.2 for the Simultaneous Closure of All Main Steam Isolation Valves combined with A Single Stuck-open Electromatic Relief Valve, Failed Isolation condensers, and Loss of Feedwater evaluated by the EPRI Best Estimate Thermal Analysis Package on January 15, 1990.

This MSIV closure transient was predicted by RELAP5 analysis using the following initial conditions: The reactor was at steady state full power (1930 MWth) with recirculation flow at 61.OE6 lbm/hr (16.E4 gpm). Reactor steam dome pressure was 1038 psia (1024 psig) and reactor level was controlled at approximately 164 inches.

All control systems were assumed to be in automatic, except that operation of the Isolation Condensers was inhibited, a single EMRV was stuck open, and the Feedwater Pumps were tripped.

The following data was recorded and selected plots of simulator and Relap5 data were printed.

Plant Parameter	Simulator Variable
*Reactor Power (%neutron flux)	SNISAPRM
*Wide Range Pressure	T:PID76A
*Wide Range Water Level	T:LIA12
*Fuel Zone Water Level	LNSSMPA,
*Fuel Zone Water Level	LNSSMPB
*Total Steam Flow	WNSSTKST
*Total Feedwater Flow	WNSSTKFT
*Drywell Bulk Temperature	TPCNDVB
*Drywell Pressure	T:PIP08
*Torus Bulk Temperature	T:TI43A
*Torus Pressure	T:PIP12
*Total Low Pressure Injection Flow	exception
*Total Low Pressure Core Spray Flow	T:F27A,
*Total Low Pressure Core Spray Flow	T:F27B
*Total High Press. Injection Flow (CRD)	WCRDRD15
Total Core Thermal Power	SRXSTOTL,
Total Core Thermal Power	CRQCORE
Total Recirculation Flow	WNSSTKRT
Recirculation Temp A	T:TE31A
Recirculation Temp B	T:TE31C
Recirculation Temp C	T:TE31E
Recirculation Temp D	T:TE31G
Recirculation Temp E	T:TE31J
Steam Flow A...B	RRWMIX(30),(31
Fuel Centerline Temperature	RRTFUEL(4)
Clad Temperature	RRTCLAD(4)
Moderator Temperature	RRTBULK(6)

Plant Parameter	Simulator Variable
Core Void Fraction (Top)	RRVOID(10)
Core Void Fraction (Mdl)	RRVOID(6)
Core Void Fraction (Bot)	RRVOID(3)
RV Liquid Mass	RRMLVES(1)
RV Total Fluid mass	RRMVES(1)
Iso. cond. Steam flow	RRWMIX(33), (36)
Narrow Range Reactor Level	T:LID59B

*ANS 3.5 - 1985 required.

The SAR alarm printout is also attached.

Results:

All alarms and automatic actions identified in the procedure occurred. There was little difference in predicted vs. simulator parameter values for Rx Level, Rx Pressure, Fuel Temperatures, EMRV flows, and Rx Water Temperatures. The reference data does not reflect the tripping of three recirculation pumps. It shows a general flow decrease. The reference data also shows high (600 psig) steam header pressure with the MSIV's closed. The simulator shows them dropping off to a much lower pressure.

No unwarranted alarms or automatic actions occurred.

As expected, the reactor scrammed from the MSIV closure. Three recirc pumps tripped, and two EMRV's opened to relieve pressure. The stuck open relief valves caused torus temperature to increase at 1.65 degrees F per minute.

The simulator response was found acceptable.

AVAILABLE OPTIONS:

This test was written to satisfy the required ANS 3.5 transient and therefore has no options. The malfunctions used to initiate the transient have options of equipment to fail, ramp time, and delay time.

OPTIONS TESTED:

The A EMRV was chosen to stick open because both the A and D EMRV's should open on an MSIV closure event.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power Operation was used.
Recirculation flow, control rods per the pull sheets and other Controls were adjusted as necessary to achieve the following conditions.

Reactor Power	1930 MWth	
Recirculation flow	16E4 gpm	
Reactor Pressure	1024 psig	
Reactor Level	164"	(Set at 163.5)

The established condition was stored in IC-196.

A Drill File was established to automatically collect data and insert the selected malfunctions.

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, reactor level and pressure are decreasing due to the stuck open relief valve. The simulator is capable of continuing the scenario. The malfunctions can be cleared by the instructor to continue recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE
TEST RESULTS:

OC Replica simulator Transient Test Data Simultaneous closure of All MSIV's combined with a single Stuck-Open EMRV, Failed Isolation Condensers and Loss Of Feedwater: NSSS Response, January 17, 1990. (OCS-5117) (RELAP5)

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

Relap data was available for only a few parameters.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

The differences between the simulator and Relap5 data were within the ability of Relap to predict plant response and changes made to the plant/simulator in the past years (DFCS, DRCS, Level set down, ATWOS Recirc Pump Trip).

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS79
14.6.45.25

TITLE: Loss of All AC Power with EMRV Failure to Close (PRA Scenario 3.2.1)

PREPARED BY/DATE: ______ / 10/27/97

TEST DATE: 09/18/97

APPROVED BY/DATE: R Davidson / 12/16/97

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF3	3.1.1(2)(d)	Failure of safety and relief valves (LOCA)
MF5	3.1.2(3)	Loss or degraded electrical power, including loss of offsite, loss of diesels, loss to plant buses, & loss to instrument buses (A.C & D.C.)
MF12	3.1.2(10)	Loss of all feedwater (normal and emergency)
MF16	3.1.2(14)	Fuel cladding failure and associated alarms
MF24	3.1.2(23)	Passive malfunctions in emergency systems

ANS 3.5 APPENDIX A REQUIREMENTS

A3	A3.2(2)	Ability to operate with similar plant operating procedures
A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING
PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

This procedure is used to verify simulator response to a loss of offsite power with stuck open Electromatic Relief Valves (EMRV). This event was selected because of the contribution to core damage probability, as determined by plant specific Probabalistic Risk Assessment (PRA) studies. This single event constitutes 22.69% of the total core damage frequency.

Passive Malfunctions are activated for both Diesel Generators and two EMRVs:

DGN-3A	DG 1 Fails to Start
DGN-3B	DG 2 Fails to Start
NSS-24A	EMRV A Sticks Open

NSS-24D EMRV D Sticks Open

Malfunction OED-3, Loss of Offsite Power Sources is then activated to initiate the transient.

With no AC power, the EMRVs will open to control pressure following Reactor and containment isolation. The malfunctions will cause 2 EMRVs to remain open. Reactor level is expected to decrease to 0 in. TAF (i.e. to the top of active fuel) in approximately 37 minutes. Drywell temperature and pressure increase significantly. Fuel damage is expected.

The following variables are monitored using Datapool Monitoring:

RRTFUEL(1)-(8)	Core average Fuel Temperature
RRTCLAD(1)-(8)	Fuel Cladding Temp.
LNSSMPA - D	Fuel Zone Level
T:LP09B	Torus Level
RRMSVMR(1)	CHRMS Containment Radiation
PPCND	Drywell Pressure
TPCNDVB	Drywell Temperature (Bulk)

The SAR alarm printout was also attached.

Results:

The test was run two times. The first run included injection of fire water when reactor pressure decreased to < 137 psig. The second run was allowed to proceed with no core cooling.

The passive malfunctions inserted included sticking both A and B EMRVs open. During the transient, the B EMRV was not required to open and therefore did not stick in the open position.

During the first run of the test, level dropped to 0 inches TAF in approximately 33 minutes, at which time the test

operator initiated Emergency Depressurization and Fire Water injection. The test was terminated when Reactor Level recovered to 166 inches approximately 10 minutes later.

During the second run, without Fire Water injection, level decreased to Lo Lo Lo in 43 minutes and eventually to < -150 inches (150 inches below Top of Active Fuel). Fuel cladding temperature increased slowly. Fuel failure occurred approximately three hours after the event, as indicated by reactor coolant radioactivity.

The Containment High Range Radiation Monitor (CHRMS) looses power during this event, removing the operator's primary indication of fuel failure.

It was also noted that the SPDS Heat Removal/Core Cooling screen is of little help to the operator. The screen indicated 100" Wide Range, 90" GEMAC, 85" Yarway, and 180" Fuel Zone A &

B, while actual level was -130" on Fuel Zone C & D.

All alarms and automatic actions occurred as expected and no unwarranted alarms were received.

AVAILABLE OPTIONS:

This procedure is written to duplicate a specific analysis and therefore has no options.

OPTIONS TESTED:

There are no options available in this procedure.

INITIAL CONDITIONS FOR TEST:

IC-15, Full Power.

Passive Malfunctions are activated for EMRVs and Diesel Generators.

FINAL TEST CONDITIONS:

Procedure execution time: 5 Hours.

Run 1:
At the conclusion of this test, the reactor has been reflooded by injecting Firewater with the Core Spray System. The simulator is capable of continuing the recovery operations.

Run 2:
At the conclusion of this test, reactor water level was 120 inches below the top of the active fuel. The simulator is capable of continuing the recovery operations.

The simulator passed this test with 1 new TR issued.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test is based on an Oyster Creek Plant specific PRA analysis.

The test procedure contains the expected simulator response.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS80
14. 6.40.15.00

TITLE: MOOG Valve Fails

PREPARED BY/DATE: John Salvatore / 8/7/00

APPROVED BY/DATE: Adam H. Harvey / 8/21/00

TEST DATE: 08/16/2000

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures
MF26	3.1.2(25)	Reactor pressure control system failure (including bypass valve failure)

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Malfunction Cause: Failure of the Moog Valve.

The EPR Moog valve fails such that the EPR servo continues in the decreasing or increasing direction, or stays as-is as determined by the instructor.

With the malfunction activated in the decrease direction, the EPR position indicator will increase. Control valves open to 100%. Number 1 Bypass Valve will fully open and Number 2 Bypass valve will partially open until the steam flow limit is reached. Operation of the EPR power switch on panel 7F has no effect. Steam line pressure decreases to 850 psi, causing MSIV closure and a reactor scram.

The following data was recorded using the instructor station trend screens:

T:XAPRM3	APRM Channel 3
WNSSTKST	Total Steam Flow
RTCSCV(1)	Control Valve #1 Position
RTCSCV(2)	Control Valve #2 Position
RTCSCV(3)	Control Valve #3 Position
RTCSCV(4)	Control Valve #4 Position
RTCSBV(1)	Bypass Valve #1 Position
RTCSBV(2)	Bypass Valve #2 Position
RTCSBV(3)	Bypass Valve #3 Position
T:PIA92A	Reactor Pressure
T:PD76X	Reactor Pressure (Wide Range)
T:F42201	Total FW Flow
T:PPT1	Throttle Pressure
T:LRE21A	Reactor Level (Yarway)
T:LRE05A	Reactor Level (Yarway)
T:LIA12	Reactor Level (Wide Range)

The Trend Recorder printouts are attached.

Results:

The Turbine Control System functioned correctly, causing the control valves to open fully followed by the full opening of # 1 Bypass Valve and partial opening of # 2 Bypass Valve.

With the control and bypass valves opened to the maximum permitted by the flow limit, reactor pressure decreased to the Main Steam Line Low Pressure setpoint, causing the MSIV's to close. This resulted in an automatic reactor scram from MSIV Closure. All expected automatic actions and alarms occurred.

The Reactor scram occurred approximately three to four minutes after the malfunction was inserted. When this event occurred in the plant on June 12, 1985, approximately 4 minutes elapsed between the failure and the reactor scram.

AVAILABLE OPTIONS:

Failure Mode: (direction)	OPTION 1	Sticks in decreasing pressure
	OPTION 2	Sticks in increasing pressure
	OPTION 3	Sticks as-is

Delay Time: 0-28,800 sec.

OPTIONS TESTED:

This test was performed using OPTION 1, Sticks in decreasing pressure direction.
Testing use of the other two options is not required.

Fail as is:
A MOOG valve sticking would result in no power changes.
Fail in increasing value:
Use of the increasing MOOG valve failure would result in the MPR assuming the EPR function and stopping any transient after the separation band between the EPR and MPR was exhausted.

INITIAL CONDITIONS FOR TEST:

IC-15, 100% Power (MOL)

FINAL TEST CONDITIONS:

Run Time: 1 Hour

At the conclusion of this test, the reactor is in a post scram condition. The malfunction is not recoverable and remains active. The simulator is capable of continuing the recovery operations but IC reset is required to clear the malfunction.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected response of the simulator in the Detailed Plant Response section.

A similar event occurred in the Oyster Creek Plant on June 12, 1985. This event is described in Transient Assessment Report TAR-OC-008. TAR-OC-008 was used as a reference when preparing the test procedure.

DEFICIENCIES FOUND, CORRECTIVE
ACTION TAKEN OR PLANNED, AND
SCHEDULED DATE FOR COMPLETION:

The plant transient Main Steam Line Low Pressure occurred in approximately four minutes following the failure on the simulator. The previous test of this event occurred within 25 seconds; this was corrected. This simulator transient took approximately the same elapsed time as in the plant event of June 12, 1985.

EXCEPTIONS TO ANSI/ANS 3.5-1985
TAKEN AS A RESULT OF THIS TEST,
INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS81
14.6.27.5

TITLE: Recirculation M-G Set Flow Controller Oscillation

PREPARED BY/DATE: ____ / 10/5/99

TEST DATE: 09/21/1999

APPROVED BY/DATE: R Dawson / 11/30/99

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in 3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance

criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

This test was added to the Certification Test List in November 1995 to replace 14.6.27.4 (TTS33), Recirculation Master Controller Fails. The "Recirculation Master Controller Fails" Malfunction (RFC-4) became inoperable with installation of the Digital Recirc Flow Control System in 1994. RFC-4 is not considered a credible failure following installation of the Digital Recirc Flow Control System.

Malfunction Cause: Mechanical binding in the Bailey causes the positioner to "hunt".

The Recirculation M-G flow controller develops oscillations in response to the positioner binding.

Primary Effects:

1. Oscillations in selected M/G speed (frequency) indication, Panel 3F.
2. Oscillations in selected M/A station output indication, Panel 3F.
3. Oscillations in M-G amp, volt, and motor amp indication, Panel 3F.

4. Oscillation in flow indication, Panel 3F, 4F.
5. Oscillations in reactor power level for severe oscillations, Panel 4F.

The following data was recorded on the 8 pen recorder:

T:FIA72D	Total Recirc Flow
T:PIA07	Core delta p
T:FIA60B	Recirc Pump B flow indicator
T:XMGBHZ	B Recirc Pump frequency
T:XMGBV	B Recirc Pump volts
T:XMGBA	B Recirc Pump amps

Results:

No alarms were actuated during the test. Plant parameters responded as described in the procedure but the magnitude was not severe, even with the malfunction at 100%. The frequency was found to be 60 seconds peak to peak which differs from the 10 seconds identified in the procedure. These differences were found acceptable.

AVAILABLE OPTIONS:

(1) Faulty Controller:
RFC-5A - NG13A
RFC-5B - NG13B
RFC-5C - NG13C
RFC-5D - NG13D
RFC-5E - NG13E

(2)	Magnitude	0 - 100% 100% = 10% of the current setpoint.
(3)	Ramp Time	0 - 14,400 seconds
(4)	Delay Time	0 - 28,800 seconds

OPTIONS TESTED:

(1)	Malfunction:	RFC-5A, Recirc Pump A
(2)	Magnitude:	100%
(3)	Ramp Time:	60 seconds
(4)	Delay Time:	0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, 100 Power, MOL, Cycle 15 Core

FINAL TEST CONDITIONS:

Run Time: 42 Minutes

At the conclusion of the test, the malfunction has been cleared and the simulator returned to steady state operation at 100% power. The simulator is capable of continued simulation.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the anticipated effects in the Detailed Plant Response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.

O.C. SIMULATOR
TEST PROCEDURE ABSTRACT

PROCEDURE: TTS82
14.6.13.3

TITLE: Main Feed Regulator Valve Fails

PREPARED BY/DATE: [signature] / 10/28/98

TEST DATE: 09/14/1998

APPROVED BY/DATE: R Davidson / 12/7/98

ANSI/ANS 3.5 REFERENCES

This procedure satisfies in whole or in part the following requirements:

REQUIRED NORMAL EVOLUTIONS

N/A

REQUIRED TRANSIENTS (SECTION B.1.2)

N/A

REQUIRED MALFUNCTIONS

MF11	3.1.2(9)	Loss of normal feedwater or normal feedwater system failure
MF19	3.1.2(17)	Control system failure affecting reactivity and core heat removal (including bypass valve failure)
MF23	3.1.2(22)	Process instrumentation, alarms, and control system failures

ANS 3.5 APPENDIX A REQUIREMENTS

A4	A3.4	Malfunction tests (each generic malfunction)

ANS 3.5 APPENDIX B REQUIREMENTS

N/A

THIS PROCEDURE IS SUBJECT TO THE FOLLOWING PERFORMANCE CRITERIA SPECIFIED IN ANSI/ANS 3.5:

Tests shall be conducted to prove the capability of the simulator to perform correctly during the limiting cases of those evolutions identified in

3.1.1 (Normal Plant Evolutions) and 3.1.2 (Plant Malfunctions) of ANSI/ANS 3.5-1985. Acceptance criteria for these tests shall:

a. Where applicable, be the same as plant startup test procedure acceptance criteria;
b. Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.
c. Require that the simulator shall not fail to cause an alarm or automatic action if the reference plant would have caused an alarm or automatic action, and conversely, the simulator shall not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

Malfunctions and transients shall be tested and compared to best estimate or other available information and shall meet the following acceptance criteria:

Require that the observable change in the parameters correspond in direction to those expected from a best estimate for the simulated transient and do not violate the physical laws of nature.

TEST DESCRIPTION:

Test Procedure 14.6.13.3 was originally titled Individual Feedwater Control M/A Station Fails. The title and implementation of the malfunction were changed following installation of the Digital Feedwater Control System (DFCS). The DFCS was installed in the plant and the simulator in 1994.

This procedure was added to the Certification Test Procedure list in November, 1995 to replace 14.6.13.1 (TTS59), Master Feedwater Controller Fails. The Master Feedwater Controller Malfunction FWC-1 was made inoperable during the DFCS modification. FWC-1 is not considered a credible failure for the new system.

Malfunction Cause: Faulty Feedwater Reg. Valve Positioner.

The plant is operating with feedwater control in automatic when a feed reg. valve fails.

Primary Effects:

Assume the simulator is at 100% power when a feed reg. valve fails:

A. Failed Closed:

1. Flow in affected loop decreases to zero.
2. Remaining pumps increase flow to flow limit.
3. Reactor level decreases to scram setpoint.

B. Failed in intermediate position:

1. Feedwater flow in affected pump remains constant.
2. Remaining pumps control feedwater flow within range of zero flow to the flow limit.

C. Failed Open:

1. Flow in affected pump increases above the flow limit.
2. Remaining pumps decrease flow to control reactor level.
3. Pump may trip on high current.

Results:

The 8 Pen Recorder was used to collect traces on the following:

T:FID36A	A Feed Pump Flow
T:FID36A	A Feed Pump Flow
T:FID36A	A Feed Pump Flow
T:LID14	Reactor Level

All alarms and automatic actions occurred as specified in the test procedure.

The Sequence of Alarms Recorder (SAR) printout was attached.

AVAILABLE OPTIONS:

(1)	Faulty Reg. valve	FWC-3A A FW Reg. Valve FWC-3B B FW Reg. Valve FWC-3C C FW Reg. Valve
(2)	Severity	0 - 100% 0% = Full Closed 100% = Full Open
(3)	Ramp Time:	0 - 14,400 seconds
(4)	Delay Time:	0 - 28,800 seconds

OPTIONS TESTED:

FWC-3A:	A FW Reg. Valve Fails
Severity:	0%
Ramp Time:	0 seconds
Delay Time:	0 seconds

INITIAL CONDITIONS FOR TEST:

IC-15, 100% Power, MOL, Cycle 15.

FINAL TEST CONDITIONS:

Run Time: 30 Minutes

At the conclusion of the test, the reactor has scrammed on low level. Automatic actions caused by low and low low level have occurred and water level has increased above these setpoints.

The simulator is capable of continued simulation should the instructor need to continue recovery operations.

The simulator passed this test.

BASELINE DATA USED TO EVALUATE TEST RESULTS:

The test procedure contains the expected results in the detailed plant response section.

DEFICIENCIES FOUND, CORRECTIVE ACTION TAKEN OR PLANNED, AND SCHEDULED DATE FOR COMPLETION:

None.

EXCEPTIONS TO ANSI/ANS 3.5-1985 TAKEN AS A RESULT OF THIS TEST, INCLUDING JUSTIFICATION:

None.