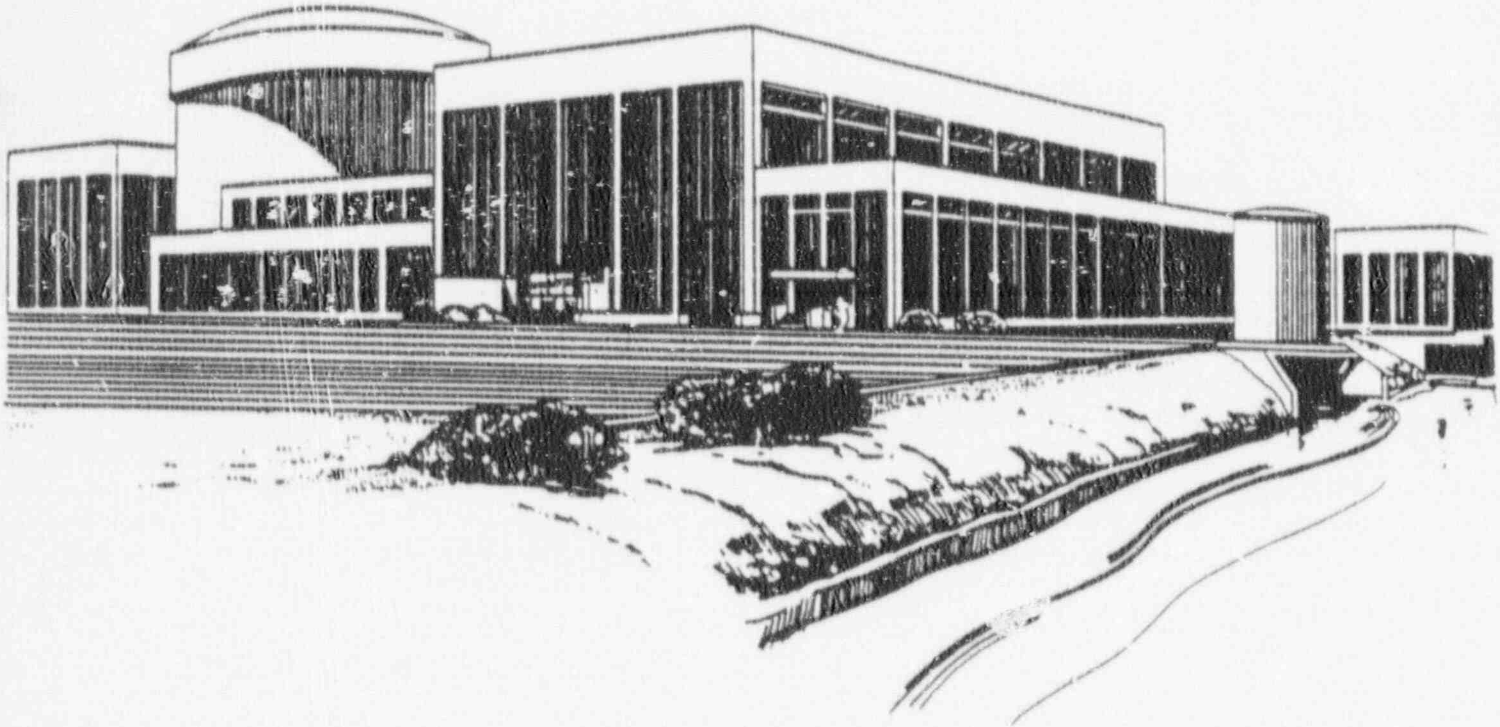

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION
UNIT 1

NRC Form 474 Submittal
for
SIMULATOR CERTIFICATION

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

U.S. NUCLEAR REGULATORY COMMISSION

SIMULATION FACILITY CERTIFICATION

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

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

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

FACILITY
Fort Calhoun Station, Unit 1

DOCKET NUMBER
50-285

LICENSEE
Omaha Public Power District

DATE
2-8-91

This is to certify that:

1. The above named facility licensee is using a simulation facility consisting solely of a plant-referenced simulator that meets the requirements of 10 CFR 55.45.
2. Documentation is available for NRC review in accordance with 10 CFR 55.45(b).
3. This simulation facility meets the guidance contained in ANS/ANS 3.5, 1985, as endorsed by NRC Regulatory Guide 1.149.
If there are any exceptions to the certification of this item, check here [X] and describe fully on additional pages as necessary. See Attachment

NAME (or other identification) AND LOCATION OF SIMULATION FACILITY

Fort Calhoun Training Center
Fort Calhoun, NE 68023

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

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

See attached computer Real Time Test, Steady State and Normal Operations Tests, Transient Tests, Malfunction Tests, Other Tests (Appendix 3.A)

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

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

See attached Schedule for Performance and Operability Tests (Appendix B)

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

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

Not Applicable -- Initial Certification

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

Not Applicable -- Initial Certification

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

SIGNATURE — AUTHORIZED REPRESENTATIVE	TITLE	DATE
W. G. Gates	Division Manager, Nuclear Operations	2-13-91

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

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

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

ATTACHMENT
TO NRC FORM 474
SIMULATION FACILITY CERTIFICATION

1. Test Number 14.5.4.11, "Loss of Load Test" (included in Appendix 3.A, Transient Tests): An exception for this test is due to Fort Calhoun Station Unit 1 plant configuration and operations. Additional details are provided in the test summary.

OMAHA PUBLIC POWER DISTRICT
FORT CALHOUN STATION

Simulator Certification Submittal
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OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION

Simulator Certification Submittal

Section 1

OMAHA PUBLIC POWER DISTRICT
FORT CALHOUN STATION

Simulator Certification Submittal
Section 1

1. SIMULATOR INFORMATION

1.1 GENERAL

(1) Owner: Omaha Public Power District
Operator: Omaha Public Power District
Manufacturer: Westinghouse Electric Corporation

(2) Reference Plant: Fort Calhoun Station, Unit 1
Type: NSSS Combustion Engineering PWR
Turbine Generator: General Electric
Rating: 1500 MWt, 502 MWe

(3) Date Available for Training: June 16, 1990

(4) Type of Report: Initial

1.2 CONTROL ROOM FIDELITY

The simulated control room is a reproduction of the reference plant's control room. The simulator has all operational panels (less any current modifications) to provide the controls, instrumentation and alarms to accommodate operator training. The simulator's main control boards and auxiliary panels have been constructed using the reference plant's original vendor drawings. Deviations in dimensions and arrangement are minimal.

Panel controls, meters, recorders, etc., as the control boards themselves, duplicate the size, shape, color and configuration of the reference plant. Devices on the panels match the reference plant device by manufacturer, model, or external appearance. Quality photos of nonfunctional components that require no operator interaction replace internals for visual effects. All components required to conduct normal plant evolutions are functional.

The simulated control room decor has been matched to the greatest possible extent. Paint has been matched to existing color codes for both panels and control room walls. Carpeting was installed nearly simultaneously in both control rooms, as were the operator consoles. Vinyl floor covering may differ slightly in pattern. Panel access door latches, hinge placement and vent louvers may differ also. Valences on back control panels may completely extend around the back rather than existing front and sides. These slight deviations have no impact on training as they are not apparent from the operators' side of the panels.

The simulator duplicates the appearance and functional aspects of the main control room equipment and controls. The operator will be presented with an accurate representation of control room responses as would be expected during normal, abnormal and emergency operations. Those areas not simulated will not detract from the overall control panel appearance or operation.

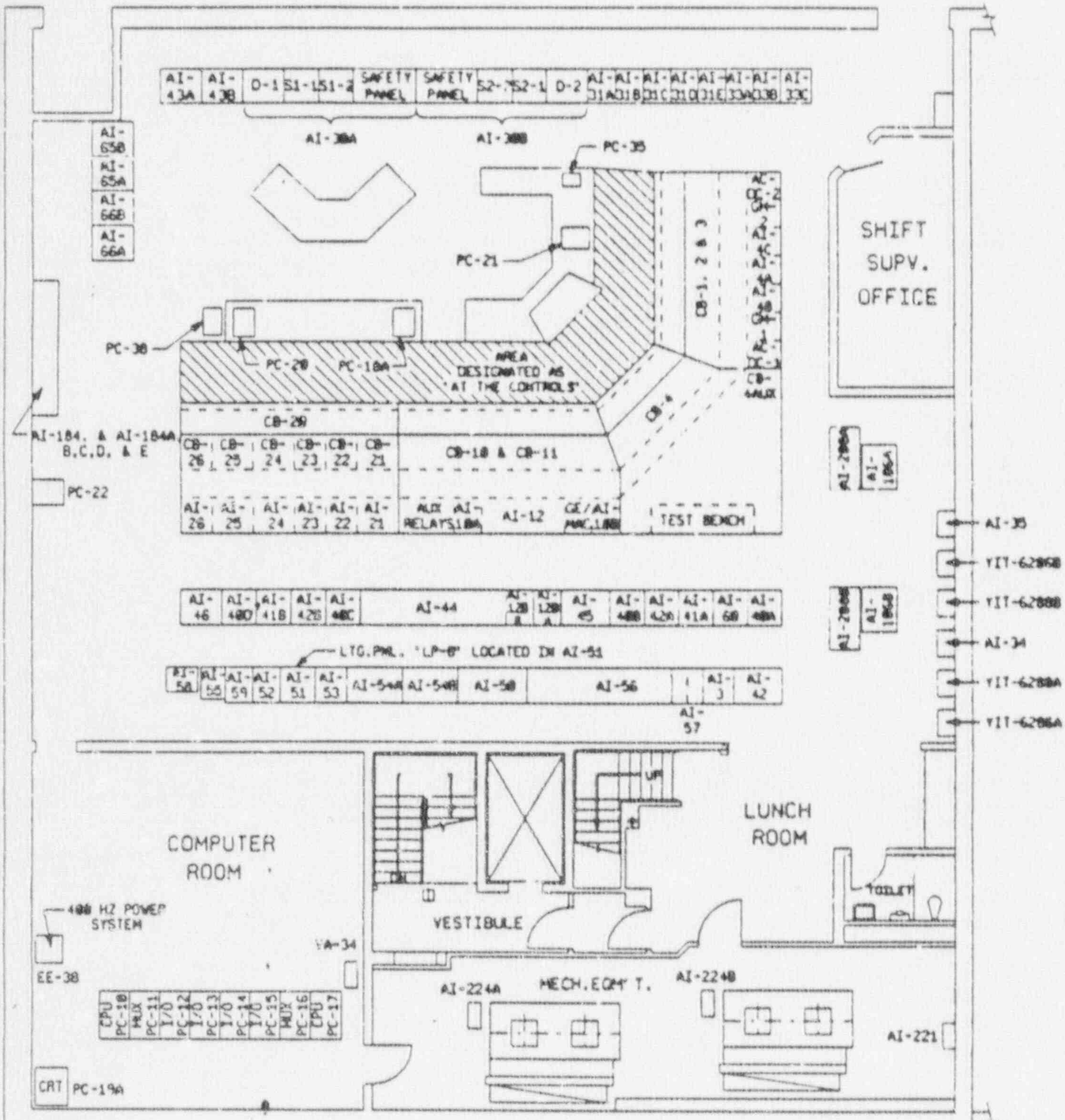
CONTROL ROOM FIDELITY (continued)

The environment in the simulated control room mimics the reference control room closely. The capability to use a noise generator to simulate normal control room sounds exists. This includes a simulated control room communications system. Main control room sounds include: main turbine/generator noise (run-up, normal, shutdown), safety valve operation, relays, automatic bus transfer and switchgear, and random operational sounds. In addition, control room lighting fluctuates according to electrical distribution system operation and malfunctions.

The facility will support and provide a current simulator for NRC operating tests and required licensed operator training.

Modifications and revisions to the simulated control room will be monitored with the Configuration Management System. Modifications associated with the reference plant after the simulator's design freeze date follow. A brief description accompanies each modification.

CONTROL ROOM



Mod #	Mod Title	Mod Description
FC81-051	Control Room Ventilation System Modification	Addition of 2 totally new panels; generation of I/O and software for new panels; HVA changes to accommodate new panels.
FC85-128	Meter Scale Modifications	Conversion of Sq. root processes to linear processes; replacement of Sq. root flow meters; replacement of Foxboro meters with Dixson meters; replacement of Sigma start-up meters; adding units to meter facefronts and changing meter scale of FIA-236.
FC88-017	Addition of a Third Aux Feedwater Pump	Pump, piping, and valve additions; control board switch, indicator, and annunciator additions; addition of accumulators for AFW valves and main FW valves; modification of main FW isolation valve circuits.
FC85-136	SGLS Block Permissive Setpoints	Replacement of S/G pressure meters; change of SGLS logic to true 2-out-of-4 logic.
FC75A-061	Component Cooling Valves Control Circuits	Replacement of CCW switches with spring return to center switches; valve handler logic changes.
FC88-011	Instrument Air Containment Isolation Valve Replacement	Addition of new valve on instrument air to containment; valve logic changes; addition of new pressure switch loop; addition of control switch and lights, and lights only on AI-43A; addition of valve position to ERF/QSPDS.
FC88-110	SI-3A/3B/3C Start Signal Logic Change	ESF logic changes for sequencers; sequencer times need to be changed; addition of new test switches; ERF timing program modification.
FC89-025	RCS Narrow Range Level Instrument	Addition of 2 new indicators on control panel; RCS model changes; addition of WR and NR level calculations.

Mod #	Mod Title	Mod Description
FC83-004B	Remaining VA-66 Flow Problems	Addition of control/interlock logic for new fan VA-121; addition of switches and lights for dampers; addition of pressure and temperature interlocks; addition of new flow controller (FIC-766).
FC81-064	RCS Hot Leg Level Indication	Addition of alarm bistable to LI-197 loop; addition of ERF point.
FC83-074	DC Sequencer Relay Replacement	Removal and plugging of auto-start key switches; removal and plugging of "spare" DC timers; removal and plugging of "spare" AC timers; replacement of remaining AC timers with new ones.
FC85-151	Replace Oddly Shaped Switch Handles	Replacement of switch handles on AI-179 and AI-185; modification and replacement of some meter scales; reversal of new Dixson indicators for S/G level and pressure.
FC87-037	Diesel Generator Electrical Modifications	Replacement of diesel tachometers; swapping of starting air pressure sensors to correct lines; removal of ERF points.
FC84-075	Redundant Power Supply for RW-CCW Interface Valves	Replacement of AC/RW interface valve switches; addition of an alarm window; removal of lights and switches on AI-45; addition of new switch on CB-1,2,3; Software changes.
FC87-048	Diverse Scram System (DSS) Testing	Addition of alarm windows to indicate DSS relay status; logic changes on operation of control switches.

Mod #	Mod Title	Mod Description
FC85-132	RCS Loop RTD Indicator Replacement	Replacement of RCS temperature meters with Dixsons.
FC88-067	Dedicated N2 Supply for Isolation Valves	Addition of N2 backup to instrument air for certain valves; modification of CAS model; removal of existing accumulators.
FC86-033	Evaluate Replacement of Proc/Area Radiation Monitors	Replacement of radiation monitor recorders; movement of area monitors.
FC87-055	ERF Computer Terminal Upgrade	Upgrade of control room consoles; addition of fourth terminal in control room; lazy susans for existing consoles.
FC85-196	Increased minimum flow for Pumps FW-4A/B/C	Tuning of CFW model to provide new minimum flow conditions.
FC86-046	Qualification of PZR Level Control Instrumentation	Replacement of Pressurizer level recorders (101 loop recorders).
FC87-016	Containment Sump Temperature Indication	Addition of ERF point; addition of instrument loop for containment sump temperature to software.
FC82-150B	Vac Dearator Pumps (DW-46A/B) Replacement	DW-46A/B pump capacities and operational aspects will need to be changed; CCW heat load to be added.
FC86-096	RPS Power Supplies	Replacement of RPS power supply face fronts.
FC85-022	Control Room Annunciation for Limitorque Operators	Addition of alarm window to indicate loss of power and/or thermal overload.
FC84-159	Metrascope Changeout	Addition of logic for rod drop timing; addition of I/O from AI-3.

Mod #	Mod Title	Mod Description
FC86-049	Redistribute Loads/DC Buses and Inverters	Reallocation of electrical loads.
FC87-038	Diesel Generator Mechanical Modifications	Tuning of DSG AUX model.
FC85-005	Heater Drain Pump Suction Relief Valves	Addition of valves to FWH model.
FC87-054	Fire Protection Systems Upgrade	FPS model flow path changes.
FC87-063	Diesel Generator Radiator Exhaust Damper Valves	Isolation of damper control circuit on operation of 183/MES switch.
FC88-009	Control Room Iodine Monitor (RM-065) Modification	Addition of alarm window on AI-33C; new VIAS logic may need to be added.
FC85-126	Condensate/Feedwater Switch (43/FW) Alarm	Addition of new alarm window and logic for 43/FW switch.
FC83-174	Reactor Reg/Steam Dump & Bypass Alarm	Addition of new alarm windows; addition of logic to RRS model.
FC87-032	Air Compressors for Fire Protection Deluge System	Addition of alarm window.
FC88-022	CRDR Labeling/Demarcation/Mimic/Etc.	Replacement of some of the control room labeling.
FC88-074	DCRDR Meter Banding Project	Addition of colored tape to some meter faces; replacement of other meter faces.
FC85-138	Guard Rail on Edge of Control Boards	Addition of chrome plated steel guard rail around control boards.

Mod #	Mod Title	Mod Description
FC85-142	Replacement of Sigma Meter Scales	Removal and disassembly of some meters to replace scales.
FC84-176	Letdown Level and Backpressure Control	Tuning to improve response time of PT-210.
FC87-014	Replacement of HCV-249 and HCV-2988	Valve stroke timing could be affected.
FC85-148	CIAS Emergency Operate Button Relocation	Removal and relocation of CIAS emergency operate button.
FC83-133	Control Room Indication-Diesel Gen Malfunction	Removal of ERF points; Removal of pressure switch contact; DSG AUX model changes.
FC88-036	Aux Controller for Feedwater Reg System	Power supply transfer switch logic changes; addition of new alarm window.
FC85-137	Reactor Trip Push-button Guard	Addition of reactor trip push-button guard.
FC83-166	Containment Sump Pump Level Indication and Control	Logic changes to WD-3A/B pump handler; could involve recorder hardware changes.
FC84-092B	Steam Generator Nozzle Dam Control Console	Addition of new alarm window.
FC85-130	Keylock Switch Changes	Some keys placed in key locker; other key lock switch actuators replaced by "normal" actuators.
FC85-150	Plastic Switch Guards	Installation and modification of plexiglass switch guards.
FC88-049	Installation of Instrument Air Dryer	Addition of new alarm window.

Mod #	Mod Title	Mod Description
FC89-051	Diesel Fuel Transfer Pump Install	Tuning of DSG fuel oil transfer pump characteristics.
FC89-068	AI-179 Indications	Loading of "D" inverter may need to be changed.
FC86-091	Limitorque Motor Operator Update	Valve limit switch/valve position light changes; annunciator window changes; bypass switch logic changes; replacement of HC-308 switch.
FC84-206	Setpoint Selector Switch for RM-061	Addition of new switch; modification of RM-061 setpoints.
FC74B-057	Power System Stabilizer	Changes in PSS will cause changes in GEN excitation; tuning of GEN model may be needed.
FC85-088	Acoustic Noise Generator	Addition of new label on VLPMS panel; new picture of control switch.

1.3 INSTRUCTOR INTERFACE

The Instructor System is an integrated system of hardware and software. Its primary function is to provide a flexible, comprehensive control interface to the simulator system, allowing the instructor to use the simulator in an effective manner as a training tool. An important secondary function of the Instructor System is to provide the instructor with a set of monitoring tools. These tools are useful in evaluating the state of the simulation and the performance of the trainees. The Instructor System also gives the hardware engineer access to a series of diagnostic programs to test the control panel display/control equipment and the control panel/computer interface equipment. Capabilities included in the software are useful in the testing and debugging of simulator software.

Operation of the Instructor System is possible from three different types of control stations. The first control station is the primary control console which is located in the instructor booth. The second control station is a moveable secondary control console located on the simulated control room floor. And, finally, hand-held remote control units can be activated up to 100 feet from the center of the control panels, thus providing the instructor with the ability to control the simulator from any point in the simulator area.

The primary control console is located in the instructor's booth and consists of two CRTs (with touchscreens and a mouse for cursor control), a keyboard, a color CRT screen copier, and a printer.

The secondary instructor's console is a portable roll-around unit that contains the SUN monitor, keyboard and mouse. The console is easily maneuverable with an anti-tipping device. The mobile unit plugs into various access outlets located on the simulator floor, so that an instructor is not hindered by a long cable.

Control Interface Description

There are three physical control interfaces available to the instructor; the primary control console, the secondary control console, and the remote control unit. The capabilities of each of these interfaces is described below:

Primary Control Console

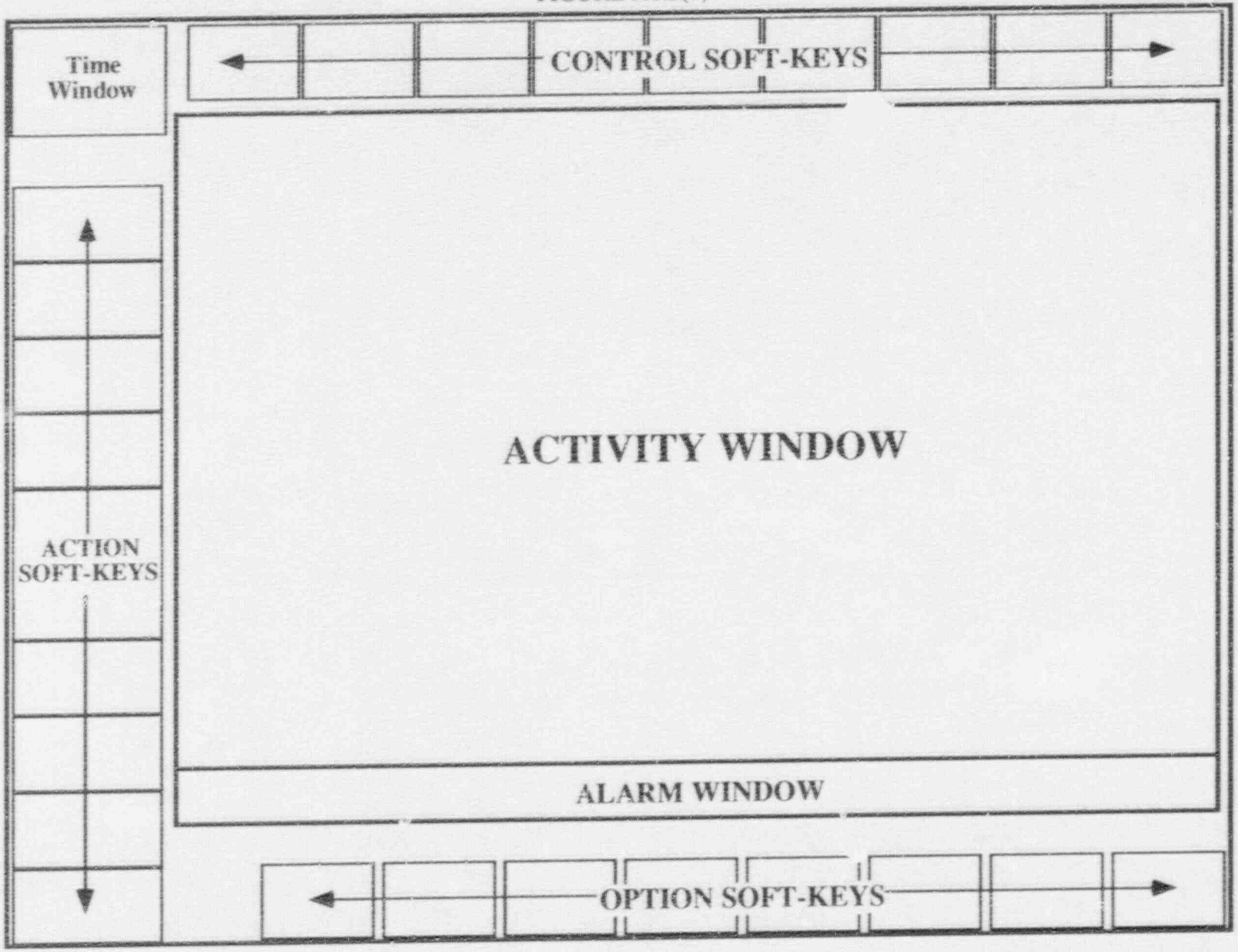
The primary control console has two CRTs. One CRT is for the display of all the Instructor System monitoring features and one CRT serves as the main control tableau. Either of these two CRTs can be used for the display of plant diagrams as well as allowing control of the LOAs, malfunctions, plant parameters, and global component failures which are accessed through these displays. Control access utilizes the touchscreen, mouse and/or keyboard. These two CRTs are serviced by a single keyboard that is assignable via cursor control. These CRTs are referred to as the monitor and control CRTs, respectively, throughout this section.

Control and Monitor CRT Windows

In order to provide uniformity of operation, the instructor interface with the control and monitor CRTs at both the primary and secondary control consoles is identical. Each CRT screen is broken up into six fixed windows. The window arrangement and identification is shown in Figure A1.3(1).

On the control CRT, the control menu is a series of soft keys that provide direct access to overall simulation control features, in particular, initialization, snapshot, backtrack, replay, annunciator acknowledge/reset, expert mode, and run/freeze control. The action menu provides a series of soft keys for direct access to instructor

FIGURE A1.3(1)


Time Window
CONTROL SOFT-KEYS
ACTIVITY WINDOW
ACTION SOFT-KEYS
ALARM WINDOW
OPTION SOFT-KEYS

actions that may be performed during a typical training scenario. The second page of the action menu consists of a series of soft keys for features which are not routinely accessed by an instructor. See Table A1.3(1) for a listing of the specific features that are accessed through these menus. The option menu is a variable menu that consists of text poke field, and soft keys. The exact configuration of this menu depends upon the instructor system feature accessed through the control and action menus. The time window provides the date, clock time, and simulator run time. The activity window is reserved for menus, tableau, and color graphics. The contents of this window also vary with the selected instructor system feature. The alarm window provides one line of text to identify software driven instructor system alarms. If more than one alarm is present, instructions to see the message area will be provided. The message area is accessed through a soft key and produces a display of alarms or messages in the activity window.

On the monitor CRT, the control and alarm windows are not utilized. The action menu provides soft keys for direct access to all of the monitoring functions. The only soft keys common to the action menus between the control and monitor CRTs are the HELP and PLANT DIAGRAMS keys. The option menus on the monitor CRT are identical to those on the control CRT for the same features (malfunctions, LOAs, etc.). The option menu and activity window perform varying functions, as on the control CRT, depending upon the instructor feature accessed. The activity window is the same size as the activity window on the control CRT so that the same plant diagrams can be accessed from both CRTs.

The primary means of instructor interface with the control and monitor CRT screens is the touchscreen. All entry selections may be made using the touchscreen, although only with limited accuracy from the plant diagrams; the coarse control of the touchscreen is the governing limitation on poke field size. Primary access to poke

TABLE A1.3(1)
Instructor System Features

	CRT Screens*	Menu
° Reboot	N/A	N/A
° Startup	N/A	N/A
° Initialization	C	Control
° Snapshot Control	C	Control
° Backtrack	C	Control
° Replay	C	Control
° Annunciator acknowlege, reset and	C	Control
silence		Control
° Run/Freeze Control	C	Control
° Expert Mode	C	Control
° Malfunctions	C(C/M)	Action (Plant Diagrams)
° Local Operator Action	C(C/M)	Action (Plant Diagrams)
° Plant Parameters	C(C/M)	Action (Plant Diagrams)
° Global Component Failure	C(C/M)	Action (Plant Diagrams)
° Overrides	C	Action
° Instructor action status displays	C	Action
° Plant diagrams	C/M	Action
° Computer alarms and messages	C	Action
° Artificial noise generator	C	Action/p.2
° Instrument noise	C	Action/p.2
° Remote control unit	C	Action/p.2
° Drill library	C	Action/p.2
° Time scaling	C	Action/p.2
° Diagnostics	C	Action/p.2
° Help	C(M)	Action/p.2(Action)
° DP Monitor printer control	C(M)	Action/p.2(Action)
° Printer control	C	Action/p.2
° Trending	M	Action
° Plant status displays	M	Action
° Datapool monitor	M	Action
° Paramater databook	M	Action
° Strip chart recorder	M	Action
° Trainee performance review	M	Action
° Student record program	M	Action
° Shutdown	C	Action/p.2

*C = Control CRT/Display
M = Monitor CRT/Display

fields on the plant diagrams will be through the mouse. In this manner, the high resolution color graphics can be used to the instructor's advantage.

Additional Equipment

Additional hardware is present in the instructor's booth for the following functions:

1. Recorder Power On/Off -- Controls power to control room recorders.
2. Emergency Stop -- Cuts power to simulator.
3. Annunciator Horns On/Off -- Disables control room horns, in case of a computer failure with any horn sounding. When the horns are enabled again by this switch, they resume being silent or sounding as if they had never been disabled.
4. Communications devices, phones and plant paging system, to simulate communications from outside the control room.
5. Audio and video monitoring and recording equipment.

Hand-Held Remote Control Unit

Two wireless remote control units are provided which allow limited control of the simulator. The remote functions can be activated up to 100 feet from the center of the control panels, thus providing the instructor with the ability to control the simulator from any point in the simulator area.

The wireless transmitter has an internal antenna and is small enough to fit into a shirt pocket. It has 16 "click-type" buttons which cause 16 discrete signals to be transmitted to the receiver.

Four push-buttons on the unit are dedicated to freeze/run, switch check override, master annunciator acknowledge, and master annunciator reset. The remaining push-buttons are programmable from the instructor control console. The instructor is to review and assign functions for each of the programmable keys on the remote control unit. These functions include:

- Activation of Instructor Actions (preassigned)
- Snapshot
- Activation of Backtrack with Forward/Reverse Stepping
- Activation of Replay
- Initialization Reset
- Activation of Control Panel Hardware Diagnostic Testing
- Control of Time Scaling
- Activation of Malfunctions (preassigned)
- Termination of Malfunctions (preassigned)

Secondary Control Console

The secondary control console is a movable unit consisting of one CRT with touchscreens, a roller ball and a keyboard. The operation of the secondary control console is identical to the monitor and control CRTs of the primary control console.

When the secondary control console is operating, control of the simulation from the primary control console is relinquished; the console "in-command" at a given time has the unique prerogative of retaining or relinquishing control to the other. Control of the simulation is exchanged between the primary and secondary console by depressing the right mouse button while the cursor is on the window frame and then selecting the "give console" or "take console" option. The remote control unit interfaces with whichever console is in command.

1.3(1) Initial Conditions

The Fort Calhoun simulator has the capacity for 54 Initial Conditions (IC) to be stored. The first 24 IC's have been assigned as permanent training IC's. These 24 IC's include various modes of operation, various power levels, various times in core life and several different fission product poison concentrations. These 24 IC's are shown in Table A1.3(2).

IC's 25-54 are being used for temporary IC's. The temporary IC's are used for training and for troubleshooting simulator software problems.

IC locations 55-59 are used as a rotating snapshot buffer. IC location 60 is a default IC. IC locations 61-300 are used for the backtrack and replay option.

TABLE A1.3(2)

IC #	POWER	TIME IN LIFE	
1	0%	BOL	Cold Shutdown - RCS drained
2	0%	BOL	Cold Shutdown - PZR Bubble
3	0%	BOL	RCS heatup in progress
4	0%	BOL	RCS cooldown, on SDC
5	0%	BOL	RCS cooldown, prior to SDC
6	0%	BOL	RCS hot shutdown, borated
7	0%	BOL	Rx startup in progress
8	0%	BOL	Rx critical - cold turbine
9	15%	BOL	Ready to Sync Generator
10	30%	BOL	Xenon Increasing following startup
11	55%	BOL	Power raised from 30%
12	55%	BOL	Equilibrium Xenon
13	80%	BOL	Equilibrium Xenon
14	100%	BOL	Equilibrium Xenon
15	0%	MOL	Rx startup, post trip, Xe = 150%
16	0%	MOL	Rx critical - Post Trip
17	15%	MOL	Post Trip
18	30%	MOL	Extended Run
19	55%	MOL	Post Trip - Xenon Decreasing
20	55%	MOL	Power Decreasing, 105% Xenon
21	100%	MOL	Equilibrium Xenon
22	0%	EOL	Rx startup - Xenon Free
23	80%	EOL	106% Xenon, CH-9B in Service
24	100%	EOL	Equilibrium Xenon

1.3(2) Malfunctions

The Fort Calhoun simulator has over 500 specific malfunctions which can be initiated by the simulator instructor. These malfunctions are listed in Table A1.3(3).

Instructors are able to compose malfunctions at the primary or secondary console. Malfunctions appearing on plant diagrams can be selected for control via the mouse and, with limited accuracy, the touchscreen. Alternatively, after selecting MALF on the control CRT, the master index of plant systems will be displayed on the CRT. The instructor can select a particular system from the display so that a listing menu containing all the malfunctions for that particular system will be displayed. Next, the instructor can select the particular malfunction. If the exact malfunctions name is known initially, after selecting MALF, the instructor can type the specific malfunction mnemonic directly without reviewing any index in order to select it. A particular malfunction can also be selected directly from the malfunction status page if it appears there.

Through the malfunction option menu, the instructor can enter the following information:

- Selection of components or discrete option to be affected (such as RC-3B)
- Severity of malfunction if applicable; adjustable using numeric key entry or a sliding bar chart suitable for touchscreen or mouse adjustment
- Delay time to malfunction activation in relative simulator time
- Delay time until an active malfunction is cleared in relative simulator time for all recoverable malfunctions; this time is set at a default value of 8 hours for recoverable malfunctions
- Ramping time if applicable
- Type of trigger, either direct, remote, or Boolean (conditional) expression, if applicable

In addition, many more malfunctions can be initiated as Global Failures.

The Fort Calhoun simulator design uses a number of common handlers which simulate the common components in the plant. These common handlers include the following:

- Pump Handler for motor operated pumps and fans operated from the control room
- Controller Handler for controllers
- Control Valve Handlers for control valves which are modulated either by a controller or a modulating signal
- Valve Handier for nonmodulated valves operated from the control room
- Transmitter Handler for transmitter characteristics
- Bistable Handler for bistables
- Heat Exchanger Handler for heat exchanger

Each handler includes the simulation of common mode failures. Since each handler is used to process common components in the simulator, it is possible to malfunction any pump, controller, valve, transmitter, or bistable within the capabilities of each handler. This instructor system feature is referred to as global component failures.

The implementation of the global component failures is detailed below.

- Pumps
  - Trip due to overcurrent with or without remote reset requirement for restart
- Valves
  - Fail as is
  - Fail to specified position (MOVs and AOVs)

- Controllers
  - Fail to a selected position or as is
  - Oscillate at selected amplitude
- Transmitters
  - Fail to a selected value
  - Fail as is
- Bistables
  - Actuated
  - Inhibited
  - Fail as is
- Heat Exchangers
  - Degrade heat transfer coefficient (fouling)

Required Simulator Malfunctions

Loss of Coolant

The Fort Calhoun simulator can model a Steam Generator Tube Rupture in either or both of the Steam Generators using malfunction SGN1. The leak size can be varied from 0 to 10 full tubes in each Steam Generator.

Malfunction RCS1 can model a primary Loss of Coolant Accident in any hot or cold leg of the RCS. The break size can be varied from 0 to full pipe rupture. Saturation conditions in the RCS will result if the break size is large enough.

Malfunctions CVC1, CVC2, CVC9 and CVC10 model charging and letdown line breaks, inside and outside of containment. The break sizes can be varied from 0 to a full rupture of a charging or letdown line.

Malfunctions PRS5 and PRS6 simulate the failure of pressurizer relief and safety valves. Global Failures can also be used to fail the Pressurizer relief, safety and block valves to any position.

Loss of Instrument Air

Malfunction CAS3 can be used to simulate the rupture of an Instrument Air header in the Auxiliary Building, the Turbine Building and in Containment. These failures can be initiated individually or in combination. Malfunction CAS4 models a leak in individual Instrument Air Risers.

The Air Compressors can be failed using Global Failures.

Loss or Degraded Electrical Power to the Station

A Loss of Offsite Power to the Fort Calhoun Station can be simulated using Malfunction EDS11. A loss of power to the individual electrical busses, including the Emergency busses, can be simulated using Malfunctions EDS1 and EDS2.

A loss of the Emergency Generators can be simulated using Malfunctions DSG3, DSG4, DSG5, DSG6, DSG8, DSG10 and DSG12.

A loss of power to the AC Instrument busses can be performed using Malfunction EDS4 and a loss of power to the DC busses can be performed using Malfunction EDS3.

Loss of Forced Coolant Core Flow

Malfunctions RCP6 and RCP7 can be used to simulate the seizure or the shear of the shaft on any or all reactor coolant pumps. The reactor coolant pumps can also be tripped using Global Failures.

Loss of Condenser Vacuum Including Loss of Condenser Level Control

Malfunction CND1 will simulate a loss of condenser vacuum by air inleakage. The leak size can be varied from 0 to the equivalent of having the vacuum breaker open.

Loss of Condenser Vacuum Including Loss of Condenser Level Control (continued)

Malfunctions CND2 and CND8 simulate the loss of hotwell level control due to a leak or malfunction of the hotwell level controller. In addition, failures of the instrumentation and controllers associated with the hotwell level control system can be simulated using Global Failures.

Loss of Service Water or Cooling to Individual Components

A loss of Raw Water or degraded cooling can be simulated using Malfunctions RWS1, RWS2, and RWS3. Global failures can be used to trip the Raw Water Pumps, close valves to some individual components and cause fouling of some heat exchangers.

Loss of Shutdown Cooling

Malfunction SDC2 simulates a shutdown cooling heat exchanger inlet header leak. The size can be varied from 0 to a 12 inch header break.

A loss of shutdown cooling can be simulated by using global failures to trip the Shutdown Cooling (LPSI) pumps, to close valves between the RCS and the Shutdown Cooling System, or to fail pressure instruments which result in closing valves between the RCS and the Shutdown Cooling System.

Malfunction CCW-6 can be used to simulate a loss of CCW to the Shutdown Cooling Heat Exchangers. Other Malfunctions listed below under Component Cooling Losses can also be used to produce a loss of shutdown cooling.

Loss of Component Cooling System or Cooling to Individual Components

Malfunctions CCW1-CCW9 can be used to simulate a loss of CCW or degraded CCW performance. Global failures can be used to trip the Component Cooling Water Pumps, close valves to some individual components and cause fouling of some heat exchangers.

Loss of Normal Feedwater

Malfunctions FW1-FW6 can be used to simulate feedwater line breaks at various locations both inside and outside of containment. The leak size can be varied from 0 to 100% of the pipe size at the simulated break location.

Global Failures can be used to trip the feedwater pumps or fail the valves used to control feedwater flow.

Malfunction ESF6 can be used to cause a Steam Generator Isolation Signal Actuation which will result in a loss of normal feedwater.

Loss of all Feedwater

A loss of all feedwater can be simulated by combining one of the loss of normal feedwater events listed above with Malfunction AFW-1 (Turbine Driven AFW Pump Fails) and the Global Failure of FW-6, the motor driven AFW pump.

Loss of Protective System Channel

Malfunction EDS4, with Instrument Bus A, B, C, or D chosen, will cause all protective bistables in the selected protective system channel to fail in the tripped condition.

Malfunction RPS1 can be used to fail an interposing relay in either the energized or de-energized position.

Loss of Protective System Channel (continued)

Global Failures can be used to fail any individual protective system bistable in either position.

Control Rod Failures

Malfunction CRD5 can be used to simulate stuck control rods. Malfunction CRD6 can be used to cause selected control rods to drop into the core. Malfunctions CRD2-CRD5 can be used to simulate misaligned rods when combined with the students manually moving the rods.

Drifting rods are not simulated since all automatic control features have been removed from the Fort Calhoun Control Rod Drive System. However, uncontrolled rod motion can be simulated by using overrides. Uncoupled rods are not modeled in the Fort Calhoun Simulator.

Inability to Drive Control Rods

The inability to drive control rods can be simulated by overriding the IN-HOLD-OUT switch on CB-4 to the HOLD position.

Fuel Cladding Failure Resulting in High Activity in Reactor Coolant

Malfunction RCS3 can be used to simulate a cladding failure which results in high RCS activity.

Turbine Trip

Malfunctions TUR1, TUR2, TUR5 and EHC1 will produce a turbine trip at their higher severity levels.

Turbine Trip (continued)

A turbine trip can also be produced by overriding the turbine trip switch on the control board or by simulating a local turbine trip using a local operator action (LOA EHC1).

Generator Trip

A Generator trip can be produced using malfunction TGA4. A Generator trip can also be produced by overriding the generator breaker control switches or by using a global failure to actuate the 86 relay on the generator.

Failure in Automatic Control Systems that Affect Reactivity and Core Heat Removal

Global failures can be used to simulate the failure of any automatic control system due to either instrument or controller failures.

Failure of Reactor Coolant Pressure and Volume Control System

Global failures can be used to simulate the failure of any automatic control system due to either instrument or controller failures. This includes pressurizer pressure and level control systems. Malfunction PRS9 will simulate a variable size leak on a pressurizer instrument tap.

Reactor Trip

A simulated Reactor Trip can be initiated using the appropriate options of Malfunctions RPS1, RPS2, or CRD7. A Reactor Trip can also be initiated by overriding one of the manual reactor trip switches.

Main Steam or Feedwater Line Break(s)

Malfunctions FDW1-FDW5, MSS1-MSS7 simulate Steam and Feedwater Line Breaks. Locations both inside and outside of containment are modeled as well as Main Steam leaks due to failed Steam Generator Safety Valves. The leak size can be varied from zero to complete pipe rupture at each simulated break location.

Nuclear Instrumentation Failures

Malfunctions NIS1-NIS8 simulates various types of failures of the wide range (in both the wide range and extended range modes) and power range (safety and control channels) Nuclear Instrumentation. The wide range Nuclear Instrumentation channels operating in their extended range mode function as the source range Nuclear Instrumentation at Fort Calhoun.

Process Instrumentation, Alarms, and Control System Failures

Global failures can be used to simulate the failure of any automatic control system due to either instrument or controller failures. Any alarm can be initiated or inhibited using the override feature.

Passive Malfunctions in Systems, Such as Engineered Safety Features, Emergency Feedwater Systems

Malfunctions ESF1-ESF13 can be used to simulate various passive malfunctions of the engineered safety features actuation systems. Malfunction AFW5 can be used to simulate the failure of an AFW actuation relay.

Global Failures can be used to prevent the actuation of engineered safety features pumps and valves.

Failure of the Automatic Reactor Trip System

Malfunction RPS1 can be used to prevent an automatic reactor trip by failing three or more interposing relays in their energized state.

MALFUNCTIONS
TABLE A1.3(3)

Sys.	Number	Description
	RRS-2	* * * DELETED * * *
AFW	AFW-1	Turbine Driven AFW Pump Failure
AFW	AFW-2	Aux Feedwater Main Spply Line Lk
AFW	AFW-3A	AFW Line A Lk Inside Cont (Isol)
AFW	AFW-3B	AFW Line B Lk Inside Cont (Isol)
AFW	AFW-4	Aux Feedwater Storage Tank Leak
CAS	CAS-1A	Compr CA-1A Discharge Line Leak
CAS	CAS-1B	Compr CA-1B Discharge Line Leak
CAS	CAS-1C	Compr CA-1C Discharge Line Leak
CAS	CAS-2A	Serv Air Line Leak In Aux Bldg
CAS	CAS-2B	Serv Air Line Leak In Contmnt
CAS	CAS-2C	Serv Air Line Leak In Turb Bldg
CAS	CAS-3A	Instr Air Loop Leak In Aux Bldg
CAS	CAS-3B	Instr Air Loop Leak In Contmnt
CAS	CAS-3C	Instr Air Loop Leak In Turb Bldg
CAS	CAS-4A	Instrument Air Riser (AF) Leak
CAS	CAS-4B	Instrument Air Riser (AG) Leak
CAS	CAS-4C	Instrument Air Riser (AH) Leak
CAS	CAS-4D	Instrument Air Riser (AR) Leak
CAS	CAS-4E	Instrument Air Riser (AS) Leak
CAS	CAS-4F	Instrument Air Riser (AX) Leak
CAS	CAS-4G	Instrument Air Riser (AZ) Leak
CAS	CAS-4H	Instrument Air Riser (BB) Leak
CAS	CAS-4I	Instrument Air Riser (BF) Leak
CAS	CAS-4J	Instrument Air Riser (BL) Leak
CCW	CCW-1A	CCW Surge Tank Gas Space Leak
CCW	CCW-1B	CCW Surge Tank Liquid Space Leak
CCW	CCW-2A	Air Binding Of CCW Pump AC-3A
CCW	CCW-2B	Air Binding Of CCW Pump AC-3B
CCW	CCW-2C	Air Binding Of CCW Pump AC-3C
CCW	CCW-3A	CCW Pump AC-3A Disch Line Leak
CCW	CCW-3B	CCW Pump AC-3B Disch Line Leak
CCW	CCW-3C	CCW Pump AC-3C Disch Line Leak
CCW	CCW-4	CCW Pump Discharge Header Leak
CCW	CCW-5A	CCW Hx AC-1A Tube Leak
CCW	CCW-5B	CCW Hx AC-1B Tube Leak
CCW	CCW-5C	CCW Hx AC-1C Tube Leak
CCW	CCW-5D	CCW Hx AC-1D Tube Leak
CCW	CCW-6A	CCW Line To SDC Hx AC-4A Leak
CCW	CCW-6B	CCW Line To SDC Hx AC-4B Leak
CCW	CCW-7	Failure Of Relief Valve AC-258
CCW	CCW-8A	Detctr Well Clng Coil VA-14A Lk
CCW	CCW-8B	Detctr Well Clng Coil VA-14B Lk
CCW	CCW-9A	Containment Cooler VA-1A Leak
CCW	CCW-9B	Containment Cooler VA-1B Leak

Sys.	Number	Description
CFW	CND-1	Loss Of Main Condenser Vacuum
CFW	CND-2	Hotwell Leak
CFW	CND-3A	Cnd Pp FW-2A Suct Cplng Collaps
CFW	CND-3B	Cnd Pp FW-2B Suct Cplng Collaps
CFW	CND-3C	Cnd Pp FW-2C Suct Cplng Collaps
CFW	CND-4A	Cond Pump FW-2A Bearing Failure
CFW	CND-4B	Cond Pump FW-2B Bearing Failure
CFW	CND-4C	Cond Pump FW-2C Bearing Failure
CFW	CND-5	Condensate Clr FW-3 Tube Leak
CFW	CND-6A	Stator Cooler ST-25A Tube Leak
CFW	CND-6B	Stator Cooler ST-25B Tube Leak
CFW	CND-7	Condensate Header Break
CFW	CND-8	Hotwell Level Control Failure
CFW	CND-9	Cond Storage Tank DW-48 Leak
CFW	FDW-1A	Main FW Pump FW-4A Disch Line Lk
CFW	FDW-1B	Main FW Pump FW-4B Disch Line Lk
CFW	FDW-1C	Main FW Pump FW-4C Disch Line Lk
CFW	FDW-2	Main Feedwater Header Leak
CFW	FDW-3A	Fdln A Leak Upstream Of The FCV
CFW	FDW-3B	Fdln B Leak Upstream Of The FCV
CFW	FDW-4A	Fdln A Leak Downstrm Of The FCV
CFW	FDW-4B	Fdln B Leak Downstrm Of The FCV
CFW	FDW-5A	Fdln A Leak Inside Cnmt (non-iso
CFW	FDW-5B	Fdln B Leak Inside Cnmt (non-iso
CFW	FDW-6A	Main Feed Isol Vlv MOV-1103 Fail
CFW	FDW-6B	Main Feed Isol Vlv MOV-1104 Fail
CFW	FDW-6C	Main Feed Isol Vlv MOV-1385 Fail
CFW	FDW-6D	Main Feed Isol Vlv MOV-1386 Fail
CRD	CRD-5	Stuck Rod
CRD	CRD-6	CEDM Clutch Failure
CRD	CRD-8	Rod Ejection
CVC	CVC-1	Letdown Line Leak Inside Cnmt
CVC	CVC-2	Letdown Line Leak Outside Cnmt
CVC	CVC-3	Letdown Heat Exchanger Tube Leak
CVC	CVC-3	Letdown Hx CH-7 Tube Leak
CVC	CVC-4	Ltdn Purif System Inlet Line Lk
CVC	CVC-5	Letdown Purif Filter Blockage
CVC	CVC-5	Ltdn Purif Fltr CH-17B Blockage
CVC	CVC-6	Ltdn Purif System Outlet Line Lk
CVC	CVC-7A	VCT Leak - Gas Space
CVC	CVC-7B	VCT Liquid Space Leak
CVC	CVC-8	VCT Discharge Line Leak
CVC	CVC-9	Charging Line Leak Outside Cnmt
CVC	CVC-10	Charging Line Leak Inside Cnmt
CVC	CVC-11	Regenerative Heat Exch Tube Leak
CVC	CVC-11	Regenerative Hx CH-6 Tube Leak
CVC	CVC-12A	BA Storage Tank CH-11A Leak

Sys.	Number	Description
CVC	CVC-12B	BA Storage Tank CH-11B Leak
CVC	CVC-13	Boric Acid To Blender Line Leak
CVC	CVC-14	Demin Water To Blender Line Leak
CVC	CVC-15A	Loss Of Heat Tracing To CH-11A
CVC	CVC-15B	Loss Of Heat Tracing To CH-11B
CVC	CVC-16A	Chrgng Pp CH-1A Valve Failure
CVC	CVC-16B	Chrgng Pp CH-1B Valve Failure
CVC	CVC-16C	Chrgng Pp CH-1C Valve Failure
CVC	RCP-2A	RC-3A Seal Cooler Leak
CVC	RCP-2B	RC-3B Seal Cooler Leak
CVC	RCP-2C	RC-3C Seal Cooler Leak
CVC	RCP-2D	RC-3D Seal Cooler Leak
CVC	RCP-8A	RC-3A LP Vapor Seal Leak
CVC	RCP-8B	RC-3B LP Vapor Seal Leak
CVC	RCP-8C	RC-3C LP Vapor Seal Leak
CVC	RCP-8D	RC-3D LP Vapor Seal Leak
CWS	CWS-1A	CWS To Main Cond A South Uppr Lk
CWS	CWS-1B	CWS To Main Cond A South Lwr Lk
CWS	CWS-1C	CWS To Main Cond A North Uppr Lk
CWS	CWS-1D	CWS To Main Cond A North Lwr Lk
CWS	CWS-1E	CWS To Main Cond B South Uppr Lk
CWS	CWS-1F	CWS To Main Cond B South Lwr Lk
CWS	CWS-1G	CWS To Main Cond B North Uppr Lk
CWS	CWS-1H	CWS To Main Cond B North Lwr Lk
CWS	CWS-2A	Main Cond A South Tube Leak
CWS	CWS-2B	Main Cond A North Tube Leak
CWS	CWS-2C	Main Cond B South Tube Leak
CWS	CWS-2D	Main Cond B North Tube Leak
CWS	CWS-3A	Turbine Bearing Cooler CW-6A Lk
CWS	CWS-3B	Turbine Bearing Cooler CW-6B Lk
CWS	CWS-4A	River Water Screen A Blockage
CWS	CWS-4B	River Water Screen B Blockage
CWS	CWS-4C	River Water Screen C Blockage
CWS	CWS-4D	River Water Screen D Blockage
CWS	CWS-4E	River Water Screen E Blockage
CWS	CWS-4F	River Water Screen F Blockage
DSG	DSG-1A	D/G 1 Fuel Xfer Pp Suction Leak
DSG	DSG-1B	D/G 2 Fuel Xfer Pp Suction Leak
DSG	DSG-2A	D/G 1 Fuel Xfer Pp Disch Leak
DSG	DSG-2B	D/G 2 Fuel Xfer Pp Disch Leak
DSG	DSG-3A	D/G 1 Auxiliary Fuel Tank Leak
DSG	DSG-3B	D/G 2 Auxiliary Fuel Tank Leak
DSG	DSG-4A	D/G 1 Engine Lube Oil Sump Leak
DSG	DSG-4B	D/G 2 Engine Lube Oil Sump Leak
DSG	DSG-5A	D/G 1 Lube Oil Cooler Leak
DSG	DSG-5B	D/G 2 Lube Oil Cooler Leak
DSG	DSG-6A	Diesel Generator 1 Radiator Leak
DSG	DSG-6B	Diesel Generator 2 Radiator Leak

Sys.	Number	Description
DSG	DSG-7A	D/G 1 Starting Air Left Bank Lk
DSG	DSG-7B	D/G 1 Starting Air Right Bank Lk
DSG	DSG-7C	D/G 2 Starting Air Left Bank Lk
DSG	DSG-7D	D/G 2 Starting Air Right Bank Lk
DSG	DSG-8A	D/G 1 Failure To Start
DSG	DSG-8B	D/G 2 Failure To Start
DSG	DSG-9A	D/G 1 Governor Failure
DSG	DSG-9B	D/G 2 Governor Failure
DSG	DSG-10A	D/G 1 Field Flashing Failure
DSG	DSG-10B	D/G 2 Field Flashing Failure
DSG	DSG-11A	D/G 1 Voltage Regulator Failure
DSG	DSG-11B	D/G 2 Voltage Regulator Failure
DSG	DSG-12A	D/G 1 Output Breaker Failure
DSG	DSG-12B	D/G 2 Output Breaker Failure
DWS	DWS-1	Demin Water Surge Tank DW-39 Lk
DWS	DWS-2	Primary Water Strg Tank DW-45 Lk
DWS	DWS-3	Plugged Demineralizer Water Fltr
EDS	EDS-1A	4160 VAC Bus 1A1 Fault
EDS	EDS-1B	4160 VAC Bus 1A2 Fault
EDS	EDS-1C	4160 VAC Bus 1A3 Fault
EDS	EDS-1D	4160 VAC Bus 1A4 Fault
EDS	EDS-2A	480 VAC Bus 1B3A Fault
EDS	EDS-2B	480 VAC Bus 1B3A-4A Fault
EDS	EDS-2C	480 VAC Bus 1B4A Fault
EDS	EDS-2D	480 VAC Bus 1B3B Fault
EDS	EDS-2E	480 VAC Bus 1B3B-4B Fault
EDS	EDS-2F	480 VAC Bus 1B4B Fault
EDS	EDS-2G	480 VAC Bus 1B3C Fault
EDS	EDS-2H	480 VAC Bus 1B3C-4C Fault
EDS	EDS-2I	480 VAC Bus 1B4C Fault
EDS	EDS-3A	125 VDC Bus 1 Fault
EDS	EDS-3B	125 VDC Bus 2 Fault
EDS	EDS-4A	120 VAC Instrument Bus A Fault
EDS	EDS-4B	120 VAC Instrument Bus B Fault
EDS	EDS-4C	120 VAC Instrument Bus C Fault
EDS	EDS-4D	120 VAC Instrument Bus D Fault
EDS	EDS-4E	120 VAC Instrument Bus #1 Fault
EDS	EDS-4F	120 VAC Instrument Bus #2 Fault
EDS	EDS-6A	480 VAC Supply Xfmr T1B-3A Fault
EDS	EDS-6B	480 VAC Supply Xfmr T1B-4A Fault
EDS	EDS-6C	480 VAC Supply Xfmr T1B-3B Fault
EDS	EDS-6D	480 VAC Supply Xfmr T1B-4B Fault
EDS	EDS-6E	480 VAC Supply Xfmr T1B-3C Fault
EDS	EDS-6F	480 VAC Supply Xfmr T1B-4C Fault
EDS	EDS-6G	480 VAC Supply Xfmr T1C-3C-1 Fau
EDS	EDS-7A	Instr Bus Sply Xfmr EE-4N Fault
EDS	EDS-7B	Instr Bus Sply Xfmr EE-4P Fault
EDS	EDS-7C	Instr Bus Sply Xfmr EE-4Q Fault
EDS	EDS-7D	Instr Bus Sply Xfmr EE-4R Fault
EDS	EDS-7E	Instr Bus Sply Xfmr EE-4S Fault

Sys.	Number	Description
EDS	EDS-7F	Instr Bus Sply Xfmr EE-4T Fault
EDS	EDS-8A	Lighting Sply Xfmr T1C-3A Fault
EDS	EDS-8B	Lighting Spply Xfmr T1C-4A Fault
EDS	EDS-9A	Battery Charger #1 Fault
EDS	EDS-9B	Battery Charger #2 Fault
EDS	EDS-9C	Battery Charger #3 Fault
EDS	EDS-10A	Inverter A Fault
EDS	EDS-10B	Inverter B Fault
EDS	EDS-10C	Inverter C Fault
EDS	EDS-10D	Inverter D Fault
EDS	EDS-10E	Inverter #1 Fault
EDS	EDS-10F	Inverter #2 Fault
EHC	EHC-1	EH Fluid System Leak
EHC	EHC-2	Main Turbine Failure To Trip
EHC	EHC-3A	Control Valve CV-1 Failure
EHC	EHC-3B	Control Valve CV-2 Failure
EHC	EHC-3C	Control Valve CV-3 Failure
EHC	EHC-3D	Control Valve CV-4 Failure
EHC	EHC-4A	Control Valve CV1 Oscillates
EHC	EHC-4B	Control Valve CV2 Oscillates
EHC	EHC-4C	Control Valve CV3 Oscillates
EHC	EHC-4D	Control Valve CV4 Oscillates
EHC	EHC-5A	Intercept Valve IV-1 Failure
EHC	EHC-5B	Intercept Valve IV-2 Failure
EHC	EHC-5C	Intercept Valve IV-3 Failure
EHC	EHC-5D	Intercept Valve IV-4 Failure
EHC	EHC-5E	Intercept Stop Valve ISV-1 Failure
EHC	EHC-5F	Intercept Stop Valve ISV-2 Failure
EHC	EHC-5G	Intercept Stop Valve ISV-3 Failure
EHC	EHC-5H	Intercept Stop Valve ISV-4 Failure
EHC	EHC-6	Load Limit Potentiometer Failure
ESF	AFW-5A	AFW Act Relay A/RC-2A Failure
ESF	AFW-5B	AFW Act Relay A1/RC-2A Failure
ESF	AFW-5C	AFW Act Relay B/RC-2A Failure
ESF	AFW-5D	AFW Act Relay B1/RC-2A Failure
ESF	AFW-5E	AFW Act Relay A/RC-2B Failure
ESF	AFW-5F	AFW Act Relay A1/RC-2B Failure
ESF	AFW-5G	AFW Act Relay B/RC-2B Failure
ESF	AFW-5H	AFW Act Relay B1/RC-2B Failure
ESF	ESF-1A	SGLP Logic Matrix Failure Trn A
ESF	ESF-1B	SGLP Logic Matrix Failure Trn B
ESF	ESF-2A	CPHS Logic Matrix Failure Trn A
ESF	ESF-2B	CPHS Logic Matrix Failure Trn B
ESF	ESF-3A	STLS Logic Matrix Failure Trn A
ESF	ESF-3B	STLS Logic Matrix Failure Trn B
ESF	ESF-4A	CRHS Logic Matrix Failure Trn A
ESF	ESF-4B	CRHS Logic Matrix Failure Trn B
ESF	ESF-5A	PPLS Logic Matrix Failure Trn A

Sys.	Number	Description
ESF	ESF-5B	PPLS Logic Matrix Failure Trn B
ESF	ESF-6A	SGIS Actuation Failure Trn A
ESF	ESF-6B	SGIS Actuation Failure Trn B
ESF	ESF-7A	CSAS Actuation Failure Trn A
ESF	ESF-7B	CSAS Actuation Failure Trn B
ESF	ESF-8A	RAS Actuation Failure Trn A
ESF	ESF-8B	RAS Actuation Failure Trn B
ESF	ESF-9A	CIAS Actuation Failure Tr A
ESF	ESF-9B	CIAS Actuation Failure Tr B
ESF	ESF-10A	SIAS Actuation Failure Trn A
ESF	ESF-10B	SIAS Actuation Failure Trn B
ESF	ESF-11A	VIAS Actuation Failure Tr A
ESF	ESF-11B	VIAS Actuation Failure Tr B
ESF	ESF-12A	OPLS Logic Matrix Failure Trn A
ESF	ESF-12B	OPLS Logic Matrix Failure Trn B
ESF	ESF-13A	D/G Sequencer S2-1 Failure
ESF	ESF-13B	D/G Sequencer S2-2 Failure
FPS	FPS-1	Fire Protection System Leak
FPS	FPS-2A	Xmfr T-1 Deluge System Actuation
FPS	FPS-2B	Xmfr T1A-1 Deluge System Actuation
FPS	FPS-2C	Xmfr T1A-2 Deluge System Actuation
FPS	FPS-2D	Xmfr T1A-3 Deluge System Actuation
FPS	FPS-2E	Xmfr T1A-4 Deluge System Actuation
FPS	FPS-2F	D/G Rooms Deluge System Actuatioon
FPS	FPS-2G	TSC Deluge System Actuation
FPS	FPS-2H	A/B Hatchway Deluge System Actuation
FPS	FPS-2I	A/B Stairway Deluge System Actuation
FPS	FPS-2J	Room 19 Deluge System Actuation
FPS	FPS-3A	Tur Bldg Sprinkler Sys Actuation
FPS	FPS-3B	AFW Pump Room Sprinkler Sys Actuation
FPS	FPS-3C	T.B. Office Sprinkler Sys Actuation
FWH	FWH-1A	LP Feedwater Htr FW-11A Tube Lk
FWH	FWH-1B	LP Feedwater Htr FW-11B Tube Lk
FWH	FWH-1C	LP Feedwater Htr FW-12A Tube Lk
FWH	FWH-1D	LP Feedwater Htr FW-12B Tube Lk
FWH	FWH-1E	LP Feedwater Htr FW-13A Tube Lk
FWH	FWH-1F	LP Feedwater Htr FW-13B Tube Lk
FWH	FWH-1G	LP Feedwater Htr FW-14A Tube Lk
FWH	FWH-1H	LP Feedwater Htr FW-14B Tube Lk
FWH	FWH-1I	LP Feedwater Htr FW-15A Tube Lk
FWH	FWH-1J	LP Feedwater Htr FW-15B Tube Lk
FWH	FWH-1K	HP Feedwater Htr FW-16A Tube Lk
FWH	FWH-1L	HP Feedwater Htr FW-16B Tube Lk
FWH	FWH-2A	Lp Heater FW-13A Shell Leak
FWH	FWH-2B	Lp Heater FW-13B Shell Leak
FWH	FWH-3	Heater Drain Pump Disch Hdr Lk
FWH	FWH-4	Heater Drain Tank Leak

Sys.	Number	Description
GEN	GEN-1A	Voltage Reg Failure - Auto Mode
GEN	GEN-1B	Voltage Reg Failure - Manual Mod
GEN	GEN-2	Main Generator Otpt Brkr Failure
GEN	GEN-3	Main Generator Exciter Failure
GEN	GEN-4	Main Generator Field Brkr Failure
NIS	NIS-1A	Chan A Wide Range Detector Failure
NIS	NIS-1B	Chan A Ext Range Detector Failure
NIS	NIS-1C	Chan B Wide Range Detector Failure
NIS	NIS-1D	Chan B Ext Range Detector Failure
NIS	NIS-1E	Chan C Wide Range Detector Failure
NIS	NIS-1F	Chan C Ext Range Detector Failure
NIS	NIS-1G	Chan D Wide Range Detector Failure
NIS	NIS-1H	Chan D Ext Range Detector Failure
NIS	NIS-2A	Wide Range Pwr Supply A Fails Lo
NIS	NIS-2B	Wide Range Pwr Supply A Fails Hi
NIS	NIS-2C	Wide Range Pwr Supply B Fails Lo
NIS	NIS-2D	Wide Range Pwr Supply B Fails Hi
NIS	NIS-2E	Wide Range Pwr Supply C Fails Lo
NIS	NIS-2F	Wide Range Pwr Supply C Fails Hi
NIS	NIS-2G	Wide Range Pwr Supply D Fails Lo
NIS	NIS-2H	Wide Range Pwr Supply D Fails Hi
NIS	NIS-3A	Extended Range B/S A Fails Energ
NIS	NIS-3B	Extended Rng B/S A Fails Deenerg
NIS	NIS-3C	Extended Range B/S B Fails Energ
NIS	NIS-3D	Extended Rng B/S B Fails Deenerg
NIS	NIS-3E	Extended Range B/S C Fails Energ
NIS	NIS-3F	Extended Rng B/S C Fails Deenerg
NIS	NIS-3G	Extended Range B/S D Fails Energ
NIS	NIS-3H	Extended Rng B/S D Fails Deenerg
NIS	NIS-4A	Chan A W/R Discrimination Fail
NIS	NIS-4B	Chan A Ext Rng Discr Failure
NIS	NIS-4C	Chan B W/R Discrimination Fail
NIS	NIS-4D	Chan B Ext Rng Discr Failure
NIS	NIS-4E	Chan C W/R Discrimination Fail
NIS	NIS-4F	Chan C Ext Rng Discr Failure
NIS	NIS-4G	Chan D W/R Discrimination Fail
NIS	NIS-4H	Chan D Ext Rng Discr Failure
NIS	NIS-5A	W/R Summing Amplifier A Failure
NIS	NIS-5B	W/R Summing Amplifier B Failure
NIS	NIS-5C	W/R Summing Amplifier C Failure
NIS	NIS-5D	W/R Summing Amplifier D Failure
NIS	NIS-6A	Pwr Rng Dtctr Chan A Upper Fail
NIS	NIS-6B	Pwr Rng Dtctr Chan A Lower Fail
NIS	NIS-6C	Pwr Rng Dtctr Chan B Upper Fail
NIS	NIS-6D	Pwr Rng Dtctr Chan B Lower Fail
NIS	NIS-6E	Pwr Rng Dtctr Chan C Upper Fail
NIS	NIS-6F	Pwr Rng Dtctr Chan C Lower Fail
NIS	NIS-6G	Pwr Rng Dtctr Chan D Upper Fail
NIS	NIS-6H	Pwr Rng Dtctr Chan D Lower Fail

Sys.	Number	Description
NIS	NIS-6I	Pwr Rng Dtctr Chan 9 Upper Fail
NIS	NIS-6J	Pwr Rng Dtctr Chan 9 Lower Fail
NIS	NIS-6K	Pwr Rng Dtctr Chan 10 Upper Fail
NIS	NIS-6L	Pwr Rng Dtctr Chan 10 Lower Fail
NIS	NIS-7A	Pwr Rng Pwr Supply Chan A Fail
NIS	NIS-7B	Pwr Rng Pwr Supply Chan B Fail
NIS	NIS-7C	Pwr Rng Pwr Supply Chan C Fail
NIS	NIS-7D	Pwr Rng Pwr Supply Chan D Fail
NIS	NIS-7E	Pwr Rng Pwr Supply Chan 9 Fail
NIS	NIS-7F	Pwr Rng Pwr Supply Chan 10 Fail
NIS	NIS-8A	Pwr Rng Summing Amp Chan A Fail
NIS	NIS-8B	Pwr Rng Summing Amp Chan B Fail
NIS	NIS-8C	Pwr Rng Summing Amp Chan C Fail
NIS	NIS-8D	Pwr Rng Summing Amp Chan D Fail
NIS	NIS-8E	Pwr Rng Summing Amp Chan 9 Fail
NIS	NIS-8F	Pwr Rng Summing Amp Chan 10 Fail
PMP	TUR-6	Turning Gear Failure
RCP	RCP-1A	RC-3A Lube Oil Cooler Leak
RCP	RCP-1B	RC-3B Lube Oil Cooler Leak
RCP	RCP-1C	RC-3C Lube Oil Cooler Leak
RCP	RCP-1D	RC-3D Lube Oil Cooler Leak
RCP	RCP-3A	RCP RC-3A Upper Guide Brg Failure
RCP	RCP-3B	RCP RC-3A Lower Guide Brg Failure
RCP	RCP-3C	RCP RC-3B Upper Guide Brg Failure
RCP	RCP-3D	RCP RC-3B Lower Guide Brg Failure
RCP	RCP-3E	RCP RC-3C Upper Guide Brg Failure
RCP	RCP-3F	RCP RC-3C Lower Guide Brg Failure
RCP	RCP-3G	RCP RC-3D Upper Guide Brg Failure
RCP	RCP-3H	RCP RC-3D Lower Guide Brg Failure
RCP	RCP-4A	RCP RC-3A Thrust Bearing Failure
RCP	RCP-4B	RCP RC-3B Thrust Bearing Failure
RCP	RCP-4C	RCP RC-3C Thrust Bearing Failure
RCP	RCP-4D	RCP RC-3D Thrust Bearing Failure
RCP	RCP-5A	RCP RC-3A Upr Lube Oil Reser Lk
RCP	RCP-5B	RCP RC-3A Lwr Lube Oil Reser Lk
RCP	RCP-5C	RCP RC-3B Upr Lube Oil Reser Lk
RCP	RCP-5D	RCP RC-3B Lwr Lube Oil Reser Lk
RCP	RCP-5E	RCP RC-3C Upr Lube Oil Reser Lk
RCP	RCP-5F	RCP RC-3C Lwr Lube Oil Reser Lk
RCP	RCP-5G	RCP RC-3D Upr Lube Oil Reser Lk
RCP	RCP-5H	RCP RC-3D Lwr Lube Oil Reser Lk
RCP	RCP-6A	RCP RC-3A Shaft Seizure
RCP	RCP-6B	RCP RC-3B Shaft Seizure
RCP	RCP-6C	RCP RC-3C Shaft Seizure
RCP	RCP-6D	RCP RC-3D Shaft Seizure
RCP	RCP-7A	RCP RC-3A Shaft Shear
RCP	RCP-7B	RCP RC-3B Shaft Shear
RCP	RCP-7C	RCP RC-3C Shaft Shear
RCP	RCP-7D	RCP RC-3D Shaft Shear
RCP	RCP-9A	RCP RC-3A Lower Seal Failure

Sys.	Number	Description
RCP	RCP-9B	RCP RC-3B Lower Seal Failure
RCP	RCP-9C	RCP RC-3C Lower Seal Failure
RCP	RCP-9D	RCP RC-3D Lower Seal Failure
RCP	RCP-10A	RCP RC-3A Middle Seal Failure
RCP	RCP-10B	RCP RC-3B Middle Seal Failure
RCP	RCP-10C	RCP RC-3C Middle Seal Failure
RCP	RCP-10D	RCP RC-3D Middle Seal Failure
RCP	RCP-11A	RCP RC-3A Upper Seal Failure
RCP	RCP-11B	RCP RC-3B Upper Seal Failure
RCP	RCP-11C	RCP RC-3C Upper Seal Failure
RCP	RCP-11D	RCP RC-3D Upper Seal Failure
RCS	CRD-1A	CEDM 3 Seal Leakage
RCS	CRD-1B	CEDM 5 Seal Leakage
RCS	CRD-1C	CEDM 6 Seal Leakage
RCS	CRD-1D	CEDM 10 Seal Leakage
RCS	CRD-1E	CEDM 16 Seal Leakage
RCS	CRD-1F	CEDM 25 Seal Leakage
RCS	CRD-1G	CEDM 28 Seal Leakage
RCS	CRD-1H	CEDM 33 Seal Leakage
RCS	CRD-1I	CEDM 39 Seal Leakage
RCS	CRD-1J	CEDM 41 Seal Leakage
RCS	PRS-1	Pressurizer Surge Line Leak
RCS	PRS-2A	Przr Spray From Loop 2A Leak
RCS	PRS-2B	Przr Spray From Loop 2B Leak
RCS	PRS-3	Pressurizer Spray Line Leak
RCS	PRS-4	Pressurizer Steam Space Leak
RCS	PRS-5A	Przr PORV PCV-102-1 Failure
RCS	PRS-5B	Przr PORV PCV-102-2 Failure
RCS	PRS-6A	Przr Safety Valve RC-141 Failure
RCS	PRS-6B	Przr Safety Valve RC-142 Failure
RCS	PRS-7	Przr Reliefs' Tail Pipe Leak
RCS	PRS-8	Pressurizer Quench Tank Leak
RCS	PRS-9A	A/PE-102/120 Tap Leak
RCS	PRS-9B	LE-101X & B/PE-102/120 Tap Leak
RCS	PRS-9C	LE-101Y & C/PE-102/120 Tap Leak
RCS	PRS-9D	LE-106 & D/PE-102/120 Tap Leak
RCS	RCS-1A	RCS Loop 1 Hot Leg Leak
RCS	RCS-1B	RCS Loop 2 Hot Leg Leak
RCS	RCS-1C	RCS Loop 1A Cold Leg Leak
RCS	RCS-1D	RCS Loop 1B Int. Leg Leak
RCS	RCS-1E	RCS Loop 1B Cold Leg Leak
RCS	RCS-1F	RCS Loop 2A Cold Leg Leak
RCS	RCS-1G	RCS Loop 2A Int. Leg Leak
RCS	RCS-1H	RCS Loop 2B Cold Leg Leak
RCS	RCS-2	Variable RCS Boron Concentration
RCS	RCS-3	Fuel Element Failure

Sys.	Number	Description
RPS	CRD-7A	Failure Of Clutch Pwr Spply PS-1
RPS	CRD-7B	Failure Of Clutch Pwr Spply PS-2
RPS	CRD-7C	Failure Of Clutch Pwr Spply PS-3
RPS	CRD-7D	Failure Of Clutch Pwr Spply PS-4
RPS	RPS-1A	Failure Of Interposing Rly IR-1
RPS	RPS-1B	Failure Of Interposing Rly IR-2
RPS	RPS-1C	Failure Of Interposing Rly IR-3
RPS	RPS-1D	Failure Of Interposing Rly IR-4
RPS	RPS-2A	RPS Power Supply PS-5 Failure
RPS	RPS-2B	RPS Power Supply PS-6 Failure
RPS	RPS-2C	RPS Power Supply PS-7 Failure
RPS	RPS-2D	RPS Power Supply PS-8 Failure
RPS	RPS-2E	RPS Power Supply PS-9 Failure
RPS	RPS-2F	RPS Power Supply PS-10 Failure
RPS	RPS-2G	RPS Power Supply PS-11 Failure
RPS	RPS-2H	RPS Power Supply PS-12 Failure
RPS	RPS-2I	RPS Power Supply PS-13 Failure
RPS	RPS-2J	RPS Power Supply PS-14 Failure
RPS	RPS-2K	RPS Power Supply PS-15 Failure
RPS	RPS-2L	RPS Power Supply PS-16 Failure
RPS	RPS-3A	Failure Of Ch A APD Pos Lim Calc
RPS	RPS-3B	Failure Of Ch B APD Pos Lim Calc
RPS	RPS-3C	Failure Of Ch C APD Pos Lim Calc
RPS	RPS-3D	Failure Of Ch D APD Pos Lim Calc
RPS	RPS-4A	Chan A APD Neg Lim Calc Failure
RPS	RPS-4B	Chan B APD Neg Lim Calc Failure
RPS	RPS-4C	Chan C APD Neg Lim Calc Failure
RPS	RPS-4D	Chan D APD Neg Lim Calc Failure
RRS	CRD-2A	Failure Of Rod Group Relay RA
RRS	CRD-2B	Failure Of Rod Group Relay LA
RRS	CRD-2C	Failure Of Rod Group Relay RB
RRS	CRD-2D	Failure Of Rod Group Relay LB
RRS	CRD-2E	Failure Of Rod Group Relay R1
RRS	CRD-2F	Failure Of Rod Group Relay L1
RRS	CRD-2G	Failure Of Rod Group Relay R2
RRS	CRD-2H	Failure Of Rod Group Relay L2
RRS	CRD-2I	Failure Of Rod Group Relay R3
RRS	CRD-2J	Failure Of Rod Group Relay L3
RRS	CRD-2K	Failure Of Rod Group Relay R4
RRS	CRD-2L	Failure Of Rod Group Relay L4
RRS	CRD-2M	Failure Of Rod Group Relay RP
RRS	CRD-2N	Failure Of Rod Group Relay LP
RRS	CRD-3	Failure Of Indiv Rod Raise Relay
RRS	CRD-4	Failure Of Indiv Rod Lower Relay
RRS	MSS-8	Turbine Bypass Valve Failure

Sys.	Number	Description
RRS	RRS-1A	Main FW Reg Valve FCV-1101 Fail
RRS	RRS-1B	Main FW Reg Valve FCV-1102 Fail
RRS	RRS-3A	S/G Hi Lvl FW Isol Rly 94/903Y Fail
RRS	RRS-3B	S/G Hi Lvl FW Isol Rly 94/906Y Fail
RRS	RRS-4A	Tur Trpd FW Isol Rly 94/1101A Fail
RRS	RRS-4B	Tur Trpd FW Isol Rly 94/1102A Fail
RRS	RRS-5	Steam Dump Controller Failure
RRS	RRS-6	Stm Dump Turb Trip Intrlck Fail
RRS	RRS-7	Stm Dmp Quick Open Sol Vlv Fail
RRS	RRS-8A	TCV-909-1 Valve Failure
RRS	RRS-8B	TCV-909-2 Valve Failure
RRS	RRS-8C	TCV-909-3 Valve Failure
RRS	RRS-8D	TCV-909-4 Valve Failure
RWS	RWS-1A	RW Pump AC-10A Discharge Line Lk
RWS	RWS-1B	RW Pump AC-10B Discharge Line Lk
RWS	RWS-1C	RW Pump AC-10C Discharge Line Lk
RWS	RWS-1D	RW Pump AC-10D Discharge Line Lk
RWS	RWS-2A	RWS Strainer A Plugged
RWS	RWS-2B	RWS Strainer B Plugged
RWS	RWS-3A	Raw Water Supply Line A Break
RWS	RWS-3B	Raw Water Supply Line B Break
SFP	SFP-1A	SFP Demineralizer AC-7 Plugged
SFP	SFP-1B	SFP Filter AC-6 Plugged
SFP	SFP-2	Spent Fuel Pool Clng System Leak
SFP	SFP-3	Spent Fuel Pool Hx AC-8 Tube Lk
SGB	SGB-1A	Steam Gen RC-2A Blowdown Line Lk
SGB	SGB-1B	Steam Gen RC-2A Blowdown Line Lk
SGN	MSS-1A	Main Stm Line A Leak Inside Cnmt
SGN	MSS-1B	Main Stm Line B Leak Inside Cnmt
SGN	MSS-2A	Main Stm Safety Vlv MS-275 Fail
SGN	MSS-2B	Main Stm Safety Vlv MS-276 Fail
SGN	MSS-2C	Main Stm Safety Vlv MS-277 Fail
SGN	MSS-2D	Main Stm Safety Vlv MS-278 Fail
SGN	MSS-2E	Main Stm Safety Vlv MS-279 Fail
SGN	MSS-2F	Main Stm Safety Vlv MS-280 Fail
SGN	MSS-2G	Main Stm Safety Vlv MS-281 Fail
SGN	MSS-2H	Main Stm Safety Vlv MS-282 Fail
SGN	MSS-2I	Main Stm Safety Vlv MS-291 Fail
SGN	MSS-2J	Main Stm Safety Vlv MS-292 Fail
SGN	MSS-3A	Stm Ln A Leak Otsd Cnmt (non-iso
SGN	MSS-3B	Stm Ln B Leak Otsd Cnmt (non-iso
SGN	MSS-4A	Stm Ln A Leak Outside Cnmt (Isol
SGN	MSS-4B	Stm Ln B Leak Outside Cnmt (Isol
SGN	MSS-5A	MSIV HCV-1041A (S/G A) Failure
SGN	MSS-5B	MSIV HCV-1042A (S/G B) Failure
SGN	MSS-6A	Steam Line A To TDAFW Pump Leak

Sys.	Number	Description
SGN	MSS-6B	Steam Line B To TDAFW Pump Leak
SGN	MSS-7	Main Steam Header Leak
SGN	MSS-9A	Stm To FW-10 Leak Upstrm 1045
SGN	MSS-9B	Stm To FW-10 Leak Dwnstrm 1045
SGN	SGN-1A	Steam Gen RC-2A Tube Rupture
SGN	SGN-1B	Steam Gen RC-2B Tube Rupture
SGN	SGN-2A	LT-903X Reference Leg Leak
SGN	SGN-2B	LT-903Y Reference Leg Leak
SGN	SGN-2C	LT-906X Reference Leg Leak
SGN	SGN-2D	LT-906Y Reference Leg Leak
SIS	SDC-1A	SDC Heat Exchanger AC-4A Tube Lk
SIS	SDC-1B	SDC Heat Exchanger AC-4B Tube Lk
SIS	SDC-2	SDC Heat Exchanger Inlet Hdr Lk
SIS	SIS-1	SIRWT Leak
SIS	SIS-2A	Safety Injection Supply Hdr A Lk
SIS	SIS-2B	Safety Injection Supply Hdr B Lk
SIS	SIS-3	LPSI Line Leak
SIS	SIS-4A	HPSI Line Leak Dnstrm HCV-306
SIS	SIS-4B	HPSI Line Leak Dnstrm HCV-307
SIS	SIS-5A	SI Tank SI-6A Gas Space Leak
SIS	SIS-5B	SI Tank SI-6B Gas Space Leak
SIS	SIS-5C	SI Tank SI-6C Gas Space Leak
SIS	SIS-5D	SI Tank SI-6D Gas Space Leak
SIS	SIS-6A	SI Tank SI-6A Liquid Space Leak
SIS	SIS-6B	SI Tank SI-6B Liquid Space Leak
SIS	SIS-6C	SI Tank SI-6C Liquid Space Leak
SIS	SIS-6D	SI Tank SI-6D Liquid Space Leak
SIS	SIS-7	Containment Spray Line Leak
SWD	EDS-5A	Supply Transformer T1 Fault
SWD	EDS-5B	Supply Transformer T1A-1 Fault
SWD	EDS-5C	Supply Transformer T1A-2 Fault
SWD	EDS-5D	Supply Transformer T1A-3 Fault
SWD	EDS-5E	Supply Transformer T1A-4 Fault
SWD	EDS-11A	Switchyard 3451 Fault
SWD	EDS-11B	Switchyard 161 Fault
SWD	EDS-11C	Switchyard 111 Fault
SWD	EDS-12A	Breaker 3451-4 Fault
SWD	EDS-12B	Breaker 3451-5 Fault
SWD	EDS-12C	Breaker 111 Fault
TGA	GEN-5	Main Generator Cooling Gas Leak
TGA	GEN-6A	Stator Clng Wtr Pp ST-6B Suct Lk
TGA	GEN-6B	Stator Clng Wtr Pp ST-6B Suct Lk
TGA	GEN-7	Stator Cooling System Leak
TGA	GEN-8	Rectifier Excitation Clng Sys Lk
TGA	TUR-7	Gland Seal Steam Supply Hdr Leak

Sys.	Number	Description
TLO	TUR-1	Main Turb Lube Oil Reservoir Lk
TLO	TUR-2	Shaft-driven LO Pp Suct Line Lk
TLO	TUR-3	Lube Oil Cooler Supply Line Lk
TSI	TUR-4	Main Turbine High Eccentricity
TSI	TUR-5A	Main Turb Brg 1 High Vibration
TSI	TUR-5B	Main Turb Brg 2 High Vibration
TSI	TUR-5C	Main Turb Brg 3 High Vibration
TSI	TUR-5D	Main Turb Brg 4 High Vibration
TSI	TUR-5E	Main Turb Brg 5 High Vibration
TSI	TUR-5F	Main Turb Brg 6 High Vibration
TSI	TUR-5G	Main Turb Brg 7 High Vibration
TSI	TUR-5H	Main Turb Brg 8 High Vibration
TSI	TUR-5I	Main Turb Brg 9 High Vibration
TSI	TUR-5J	Main Turb Brg 10 High Vibration
TUR	MSS-10A	Moisture Separator ST-3A Leak
TUR	MSS-10B	Moisture Separator ST-3B Leak
TUR	MSS-10C	Moisture Separator ST-3C Leak
TUR	MSS-10D	Moisture Separator ST-3D Leak
WDS	WDS-1	Reactor Coolant Drain Tank Leak
WDS	WDS-2	Gas Decay Tank Leak

1.3(3) Local Operator Action Control

Local Operator Actions (LOAs) include such auxiliary functions as valve manipulation, remote electrical operation, and other normal operation of equipment accomplished outside the control room. These LOAs will be included for two purposes: to allow the operator to follow plant operating procedures which have visible effects in the control room; and to permit the operator to recover from malfunctions.

A list of LOAs available to the simulator instructor is shown in TABLE 1A.3(4)

LOCAL OPERATOR ACTIONS
TABLE 1A.3(4)

Sys.	Number	Description
	MIS-4	Reset Pump Trip Signal(s)
AFW	AFW-1	FW-340 - AFWST Drain to Raw Wtr
AFW	AFW-2	FW-339 - AFWST to AFW Pumps
AFW	AFW-3	FW-350 - MDAFP FW-6 Suction Vlv
AFW	AFW-4	FW-349 - TDAFP FW-10 Suction Vlv
AFW	AFW-5	FW-745 - FW-6 Disch to Mn FW Hdr
AFW	AFW-6	FW-744 - FW-10 to Main FW Hdr
AFW	AFW-7	FW-746 - AFW to Main FW Hdr
AFW	AFW-8	FW-171 - MDAFP to AFW Hdr
AFW	AFW-9	FW-172 - TDAFP to AFW Hdr
AFW	AFW-10	PCV-2613 Setpoint - N2 to AFWST
AFW	AFW-16	FW-10 - Latch TDAFP
AXS	MIS-1	Aux Boiler Status
BCW	MIS-9	AC-524 - BCW Hx CW-6A Inlet
BCW	MIS-10	AC-525 - BCW Hx CW-6B Inlet
BCW	MIS-11	Turb LO Clr A Inlt/Otlt Isol
BCW	MIS-12	Turb LO Clr B Inlt/Otlt Isol
BCW	MIS-13	Clng Wtr Src to Air Cmpr CA-1A
BCW	MIS-14	Clng Wtr Src to Air Cmpr CA-1B
BCW	MIS-15	Clng Wtr Src to Air Cmpr CA-1C
BCW	MIS-16	TCV-1919A - BCW Hx A Setpoint
BCW	MIS-17	TCV-1919B - BCW Hx B Setpoint
BCW	MIS-18	AC-528 - BCW Hx A to Cond Vac Pp
BCW	MIS-19	AC-529 - BCW Hx B to Cond Vac Pp
BCW	MIS-20	AC-526 - BCW Hx CW-6A to LO Clrs
BCW	MIS-21	AC-527 - BCW Hx CW-6B to LO Clrs
BGS	MIS-2	Nitrogen Supply Pressure
BGS	MIS-3	Hydrogen Supply Pressure
BGS	MIS-4	PCV-2625 - N2 Header Pressure
BGS	MIS-5	PCV-2606 - N2 to Cnmt Setpoint
CAS	CAS-1	CA-1A - Local MCC Switch
CAS	CAS-2	CA-1B - Local MCC Switch
CAS	CAS-3	CA-1C - Local MCC Switch
CAS	CAS-4	Compr CA-1A High Temp Trip Stpt
CAS	CAS-5	Compr CA-1B High Temp Trip Stpt
CAS	CAS-6	Compr CA-1C High Temp Trip Stpt
CAS	CAS-7	CA-100 - Cmpressr 1A Dschg Vlv
CAS	CAS-8	CA-107 - Cmpressr 1B Dschg Vlv
CAS	CAS-9	CA-111 - Cmpressr 1C Dschg Vlv
CAS	CAS-10	CA-629 - Serv Air to Cnmt & Aux
CAS	CAS-11	CA-630 - Serv Air to Intake Bldg
CAS	CAS-12	IA-515 - Aux Bld IA Lp Segr Vlv
CAS	CAS-13	IA-517 - Aux Bld IA Lp Segr Vlv
CAS	CAS-14	IA-545 - Aux Bld Lp to Cnmt Isol
CAS	CAS-15	CA-151 - Inst Air/Serv Air Xconn

Sys.	Number	Description
CAS	CAS-16	IA-203 - Tur Bld IA Lp Segr Vlv
CAS	CAS-17	IA-204 - Tur Bld IA Lp Segr Vlv
CAS	CAS-18	IA-532 - Riser 'AF' Isolation Vl
CAS	CAS-19	IA-534 - Riser 'AG' Isolation Vl
CAS	CAS-20	IA-535 - Riser 'AH' Isolation Vl
CAS	CAS-21	IA-542 - Riser 'AR' Isolation Vl
CAS	CAS-22	IA-543 - Riser 'AS' Isolation Vl
CAS	CAS-23	IA-527 - Riser 'AX' Isolation Vl
CAS	CAS-24	IA-524 - Riser 'AZ' Isolation Vl
CAS	CAS-25	IA-544 - Riser 'BB' Isolation Vl
CAS	CAS-26	IA-549 - Riser 'BF' Isolation Vl
CAS	CAS-27	IA-550 - Riser 'BL' Isolation Vl
CAS	FDW-9	IV-1151A - IA to FW Pp A Recrc V
CAS	FDW-10	IV-1151B - IA to FW Pp B Recrc V
CAS	FDW-11	IV-1151C - IA to FW Pp C Recrc V
CCW	CCW-1	AC-100 - CCW Pp 3A Suction Vlv
CCW	CCW-2	AC-102 - CCW Pp 3A Disch Vlv
CCW	CCW-3	AC-103 - CCW Pp 3B Suction Vlv
CCW	CCW-4	AC-105 - CCW Pp 3B Disch Vlv
CCW	CCW-5	AC-106 - CCW Pp 3C Suction Vlv
CCW	CCW-6	AC-108 - CCW Pp 3C Disch Vlv
CCW	CCW-7	AC-116 - CCW to Ltdn Hx Inlet Vl
CCW	CCW-8	AC-117 - CCW to SFP Hx Inlet Vlv
CCW	CCW-9	HCV-2895B - CCW to Waste Evap Pk
CCW	CCW-10	PCV-2610 - N2 Reg to CCW Srg Tk
CFW	CND-1	VD-201 - Cndnsr A to Vac Pp Isol
CFW	CND-2	VD-202 - Cndnsr A to Vac Pp Isol
CFW	CND-3	VD-203 - Cndnsr B to Vac Pp Isol
CFW	CND-4	VD-204 - Cndnsr B to Vac Pp Isol
CFW	CND-5	VD-200 - Cndnsr Vacuum Brkr
CFW	CND-6	VA-293 - Cndnsr Vac Pmp to Stack
CFW	CND-7	VD-423 - Cndnsr Vac Pmp to Atmos
CFW	CND-8	FW-1050 - Cond to Blowdown Hx
CFW	CND-9	FW-241/243 - Cond Cooler In/Out
CFW	CND-10	FW-242 - Condensate Cooler Byp
CFW	CND-11	FW-249/256 - Stator Clr A In/Out
CFW	CND-12	FW-248/255 - Stator Clr B In/Out
CFW	CND-13	FW-1051 - Cond from Blowdown Hx
CFW	CND-14	FW-285/300 - Htrs 1A-3A Cond Iso
CFW	CND-15	FW-284/299 - Htrs 1B-3B Cond Iso
CFW	CND-16	FW-303/315 - Htrs 4A-5A Cond Iso
CFW	CND-17	FW-302/314 - Htrs 4B-5B Cond Iso
CFW	CND-18	FW-309 - Htr Drn Pmps to 5A Htr
CFW	CND-19	FW-308 - Htr Drn Pmps to 5B Htr
CFW	CND-21	FW-878 - Cond Pp FW-1A Disch Vlv
CFW	CND-22	FW-879 - Cond Pp FW-1B Disch Vlv
CFW	CND-23	FW-880 - Cond Pp FW-1C Disch Vlv
CFW	CND-24	HCV-1100 - Cond to Blwdn Hx
CFW	CND-25	FW-616 - Cond M/U to Statr Clng

Sys.	Number	Description
CFW	FDW-1	FW-319 - Fdwtr Pmp FW-4A Suction
CFW	FDW-2	FW-112 - Fdwtr Pmp FW-4A Bypass
CFW	FDW-3	FW-318 - Fdwtr Pmp FW-4B Suction
CFW	FDW-4	FW-113 - Fdwtr Pmp FW-4B Bypass
CFW	FDW-5	FW-317 - Fdwtr Pmp FW-4C Suction
CFW	FDW-6	FW-114 - Fdwtr Pmp FW-4C Bypass
CFW	FDW-7	FW-119/137 - Htr 6A Cond In/Out
CFW	FDW-8	FW-120/138 - Htr 6B Cond In/Out
CFW	FDW-12	86/FW-4A TRIP SIGNAL
CFW	FDW-13	86/FW-4B TRIP SIGNAL
CFW	FDW-14	86/FW-4C TRIP SIGNAL
CFW	MIS-8	AC-590 - Cond to BCW Head Tk
CNM	CNM-1	Fan VA-3A Blade Pitch
CNM	CNM-2	Fan VA-3B Blade Pitch
CNM	CNM-3	Open YCV-747 - Byp VA-32A Start
CNM	CNM-4	Open YCV-748 - Byp VA-32B Start
CNM	CNM-5	H2 Purge Compr VA-80A Local Cntl
CNM	CNM-6	H2 Purge Compr VA-80B Local Cntl
CNM	CNM-7	Hydrogen Recombiner Local Cntrl
CNM	CNM-8	Open HCV-6602 - Byp VA-77 Start
CVC	CVC-1	CH-345 - Charging to Lp 1A
CVC	CVC-2	CH-275 - Seal Bleedoff to VCT
CVC	CVC-3	CH-191 - CH-1A/1B to HPSI
CVC	CVC-4	CH-190 - CH-1C Disch Isolation
CVC	CVC-5	CH-192 - CH-1B Disch Isolation
CVC	CVC-6	CH-193 - CH-1A Disch Isolation
CVC	CVC-7	CH-238 - Letdown to Ion Exch
CVC	CVC-8	CH-295 - Ltdn to Debor Ion Exch
CVC	CVC-9	CH-236 - Purif Ion Exch Inlet
CVC	CVC-10	CH-300 - Cation Ion Exch Inlet
CVC	CVC-11	CH-306 - Debor Ion Exch Inlet
CVC	CVC-12	CH-10 - Cation Ion Exch Status
CVC	CVC-13	CH-9B - Debor Ion Exch Status
CVC	CVC-14	PCV-2611 - N2 to VCT Reg Stpt
CVC	CVC-15	PCV-2612 - H2 to VCT Reg Stpt
CVC	CVC-16	WD-104 - VCT Vent to Waste Gas
CVC	CVC-17	CH-11A - BAT A Batch Add
CVC	CVC-18	CH-11B - BAT B Batch Add
CVC	CVC-19	CH-115 - BAT A Outlet Valve
CVC	CVC-20	CH-114 - BAT B Outlet Valve
CVC	CVC-21	CH-116 - BAT Disch Lines X-conn
CVC	CVC-22	CH-145 - BA Hdr Recirc to BAT A
CVC	CVC-23	CH-144 - BA Hdr Recirc to BAT B
CVC	CVC-24	CH-152 - Makeup Wtr to Chrg Pps
CVC	CVC-25	SI-157 - SIRWT to Chrg Pps
CVC	CVC-26	AR-213 - Ltdn Boron Conc Range

Sys.	Number	Description
CWS	CWS-1	CW-155/158 - CWS to Cond Cooler
CWS	CWS-2	CW-156/157 - CWS to BCW Cooler A
CWS	CWS-3	CW-174/175 - CWS to BCW Cooler B
CWS	CWS-4	CW-169 - Cond A Circ Wtr Outlet
CWS	CWS-5	CW-170 - Cond B Circ Wtr Outlet
CWS	CWS-6	CW-17 - Disch Tunnel Sluice Gate
CWS	CWS-7	Backwash Cond FW-1A South Side
CWS	CWS-8	Backwash Cond FW-1A North Side
CWS	CWS-9	Backwash Cond FW-1B South Side
CWS	CWS-10	Backwash Cond FW-1B North Side
CWS	CWS-11	CW-A-A1 - Cond A S.S. Nrml Inlt
CWS	CWS-12	CW-A-B2 - Cond A S.S. Alt Outlt
CWS	CWS-13	CW-A-C3 - Cond A S.S. Alt Inlt
CWS	CWS-14	CW-A-D4 - Cond A S.S. Nrml Outlt
CWS	CWS-15	CW-A-A5 - Cond A N.S. Nrml Inlt
CWS	CWS-16	CW-A-B6 - Cond A N.S. Alt Outlt
CWS	CWS-17	CW-A-C7 - Cond A N.S. Alt Inlt
CWS	CWS-18	CW-A-D8 - Cond A N.S. Nrml Outlt
CWS	CWS-19	CW-B-A1 - Cond B S.S. Nrml Inlt
CWS	CWS-20	CW-B-B2 - Cond B S.S. Alt Outlt
CWS	CWS-21	CW-B-C3 - Cond B S.S. Alt Inlt
CWS	CWS-22	CW-B-D4 - Cond B S.S. Nrml Outlt
CWS	CWS-23	CW-B-A5 - Cond B N.S. Nrml Inlt
CWS	CWS-24	CW-B-B6 - Cond B N.S. Alt Outlt
CWS	CWS-25	CW-B-C7 - Cond B N.S. Alt Inlt
CWS	CWS-26	CW-B-D8 - Cond B N.S. Nrml Outlt
CWS	CWS-27	HC-1900/1901 Screen Lvl Byp
DSG	DSG-1	FO-4A-1 FUEL PUMP SWITCH
DSG	DSG-2	FO-4B-1 FUEL PUMP SWITCH
DSG	DSG-3	SA-1-1 COMPRESSOR SWITCH
DSG	DSG-4	SA-103 - D1 AIR RVR C.C. VLV
DSG	DSG-5	SA-113 - D1 SEC AIR ISOL VLV
DSG	DSG-6	SA-114 - D1 PRI AIR ISOL VLV
DSG	DSG-7	SA-147 - D1 Cranking Air Valve
DSG	DSG-8	SA-148 - D1 Cranking Air Valve
DSG	DSG-9	SA-2-1 COMPRESSOR SWITCH
DSG	DSG-10	SA-153 - D2 AIR RVR C.C. VLV
DSG	DSG-11	SA-163 - D2 SEC AIR ISOL VLV
DSG	DSG-12	SA-164 - D2 PRI AIR ISOL VLV
DSG	DSG-13	SA-197 - D2 Cranking Air Valve
DSG	DSG-14	SA-198 - D2 Cranking Air Valve
DSG	DSG-15	SM/SS - D1 AIR REC'VR SELECT
DSG	DSG-16	D1-BLOCK START ON RPS TRIP
DSG	DSG-17	D2-BLOCK START ON RPS TRIP
DSG	DSG-18	D/G 1 Local Pnl Alrm Ack
DSG	DSG-19	86A/D1 TRIP SIGNAL
DSG	DSG-20	86A/D2 TRIP SIGNAL

Sys.	Number	Description
DSG	DSG-21	86A-OR/1AD1 TRIP SIGNAL
DSG	DSG-22	86A-OR/1AD2 TRIP SIGNAL
DSG	DSG-23	86B/D1 TRIP SIGNAL
DSG	DSG-24	86B/D2 TRIP SIGNAL
DSG	DSG-25	86B-OR/1AD1 TRIP SIGNAL
DSG	DSG-26	86B-OR/1AD2 TRIP SIGNAL
DSG	DSG-27	86/D1 TRIP SIGNAL
DSG	DSG-28	86/D2 TRIP SIGNAL
DSG	DSG-29	SA-1-1 - Drive Belt Select
DSG	DSG-30	SA-1-1 - Diesel Engine Control
DSG	DSG-31	SA-1-2 - Drive Belt Select
DSG	DSG-32	SA-1-2 - Diesel Engine Control
DSG	DSG-33	D/G 1 Output Breaker
DSG	DSG-34	D/G 2 Output Breaker
DSG	DSG-35	143/SS - D/G 1 Maint Test Switch
DSQ	ESF-61	86-1/S1-1 TRIP SIGNAL
DSQ	ESF-62	86-1/S2-1 TRIP SIGNAL
DSQ	ESF-63	86-1/S1-2 TRIP SIGNAL
DSQ	ESF-64	86-1/S2-2 TRIP SIGNAL
DSQ	ESF-65	86-2/S1-1 TRIP SIGNAL
DSQ	ESF-66	86-2/S2-1 TRIP SIGNAL
DSQ	ESF-67	86-2/S1-2 TRIP SIGNAL
DSQ	ESF-68	86-2/S2-2 TRIP SIGNAL
DWS	CND-20	HCV-1195 - Demin Water to CST
DWS	DWS-3	Demin Water Hose to CCW
DWS	DWS-6	DW-164 - Deaerator Recirc
DWS	DWS-7	DW-147 - Demin Wtr to BA Batch
DWS	DWS-8	DWS Makeup from RW Supply Pump
DWS	DWS-9	AC-666 - Demin Wtr to BCW Hd Tnk
DWS	DWS-10	PCV-1651 - CA to PW-1 Reg Stpt
DWS	DWS-11	PW-1 Vent
DWS	DWS-12	AI-104 Lcl Ann Ack P/B
DWS	DWS-13	AI-104 Lcl Ann Reset P/B
EDS	EDS-1	T1C-3A Feeder Bkr
EDS	EDS-2	T1C-4A Feeder Bkr
EDS	EDS-3	Lighting Transfer Switch
EDS	EDS-4	T1B-3D Feeder Bkr
EDS	EDS-5	MCC 3A1 Feeder Bkr
EDS	EDS-6	MCC 3A2 Feeder Bkr
EDS	EDS-7	MCC 3A3 Feeder Bkr
EDS	EDS-8	MCC 3A4 Feeder Bkr
EDS	EDS-9	MCC 4A1 Feeder Bkr
EDS	EDS-10	MCC 4A2 Feeder Bkr
EDS	EDS-11	MCC 3B1 Feeder Bkr
EDS	EDS-12	MCC 3B2 Feeder Bkr
EDS	EDS-13	MCC 3B3 Feeder Bkr
EDS	EDS-14	MCC 4B1 Feeder Bkr
EDS	EDS-15	MCC 4B2 Feeder Bkr

Sys.	Number	Description
EDS	EDS 16	MCC 4B3 Feeder Bkr
EDS	EDS-17	MCC 3C1 Feeder Bkr
EDS	EDS-18	MCC 3C2 Feeder Bkr
EDS	EDS-19	Transformer T1C-3C-1
EDS	EDS-20	MCC 4C1 Feeder Bkr
EDS	EDS-21	MCC 4C2 Feeder Bkr
EDS	EDS-22	MCC 4C3 Feeder Bkr
EDS	EDS-23	MCC 4C4 Feeder Bkr
EDS	EDS-24	MCC 3C4C-1 Feeder Bkr
EDS	EDS-25	MCC 3C4C-2 Feeder Bkr
EDS	EDS-26	AI-41A MTS Norm Sup Feeder Bkr
EDS	EDS-27	AI-41B MTS Norm Sup Feeder Bkr
EDS	EDS-28	Inverter A Feeder Bkr
EDS	EDS-29	Inverter B Feeder Bkr
EDS	EDS-30	Inverter C Feeder Bkr
EDS	EDS-31	Inverter D Feeder Bkr
EDS	EDS-32	Inverter 1 Feeder Bkr
EDS	EDS-33	Inverter 2 Feeder Bkr
EDS	EDS-34	Inverter A Static Switch
EDS	EDS-35	Inverter B Static Switch
EDS	EDS-36	Inverter C Static Switch
EDS	EDS-37	Inverter D Static Switch
EDS	EDS-39	DELETED
EDS	EDS-40	DELETED
EDS	EDS-41	DELETED
EDS	EDS-42	DELETED
EDS	EDS-43	DELETED
EDS	EDS-44	Inverter 1 Static Switch
EDS	EDS-45	Inverter 2 Static Switch
EDS	EDS-46	DELETED
EDS	EDS-47	DELETED
EDS	EDS-48	Inverter A 480VAC Feeder Bkr
EDS	EDS-49	Inverter B 480VAC Feeder Bkr
EDS	EDS-50	Inverter C 480VAC Feeder Bkr
EDS	EDS-51	Inverter D 480VAC Feeder Bkr
EDS	EDS-52	Inverter 1 480VAC Feeder Bkr
EDS	EDS-53	Inverter 2 480VAC Feeder Bkr
EDS	EDS-54	T1B-3A Feeder Bkr
EDS	EDS-55	T1B-3B Feeder Bkr
EDS	EDS-56	T1B-3C Feeder Bkr
EDS	EDS-57	T1B-4C Feeder Bkr
EDS	EDS-58	T1B-4B Feeder Bkr
EDS	EDS-59	T1B-4A Feeder Bkr
EDS	EDS-60	FP-1A Breaker
EDS	EDS-61	FW-5A Breaker
EDS	EDS-62	FW-4A Breaker
EDS	EDS-63	FW-2A Breaker
EDS	EDS-64	CW-1A Breaker
EDS	EDS-65	RC-3A Breaker
EDS	EDS-66	RC-3B Breaker

Sys.	Number	Description
EDS	EDS-67	CK-1D Breaker
EDS	EDS-68	FW-2B Breaker
EDS	EDS-69	FW-4B Breaker
EDS	EDS-70	FW-5B Breaker
EDS	EDS-71	RC-3C Breaker
EDS	EDS-72	SI-1A Breaker
EDS	EDS-73	AC-10A Breaker
EDS	EDS-74	AC-10C Breaker
EDS	EDS-75	FW-6 Breaker
EDS	EDS-76	CW-1C Breaker
EDS	EDS-77	FW-5C Breaker
EDS	EDS-78	FW-4C Breaker
EDS	EDS-79	FW-2C Breaker
EDS	EDS-80	AC-10B Breaker
EDS	EDS-81	AC-10D Breaker
EDS	EDS-82	SI-1B Breaker
EDS	EDS-83	RC-3D Breaker
EDS	EDS-84	SI-2A Breaker
EDS	EDS-85	CH-1A Breaker
EDS	EDS-86	VA-3A Breaker
EDS	EDS-87	CA-1C Breaker
EDS	EDS-88	SI-2C Breaker
EDS	EDS-89	AC-3A Breaker
EDS	EDS-90	FW-8C Breaker
EDS	EDS-91	SI-3C Breaker
EDS	EDS-92	VA-7D Breaker
EDS	EDS-93	CH-1C Breaker
EDS	EDS-94	SI-3A Breaker
EDS	EDS-95	CA-1A Breaker
EDS	EDS-96	FW-8A Breaker
EDS	EDS-97	VA-7C Breaker
EDS	EDS-98	AC-3C Breaker
EDS	EDS-99	AC-3B Breaker
EDS	EDS-100	FW-8B Breaker
EDS	EDS-101	SI-3B Breaker
EDS	EDS-102	CA-1B Breaker
EDS	EDS-103	CH-1B Breaker
EDS	EDS-104	SI-2B Breaker
EDS	EDS-105	VA-3B Breaker
EDS	EDS-106	HCV-1103 Breaker
EDS	EDS-107	HCV-1385 Breaker
EDS	EDS-108	HTR B1-G1 Breaker
EDS	EDS-109	HTR B1-G2 Breaker
EDS	EDS-110	HTR B1-G3 Breaker
EDS	EDS-111	RC-3C-1 Breaker
EDS	EDS-112	HCV-2954 Breaker
EDS	EDS-113	HCV-314 Breaker
EDS	EDS-114	HCV-317 Breaker
EDS	EDS-115	HCV-331 Breaker
EDS	EDS-116	LCV-218-2 Breaker
EDS	EDS-117	LCV-218-3 Breaker

Sys.	Number	Description
EDS	EDS-118	DW-43A Breaker
EDS	EDS-119	DW-46A-1 Breaker
EDS	EDS-120	* * * DELETED * * *
EDS	EDS-121	HCV-308 Breaker
EDS	EDS-122	HCV-383-3 Breaker
EDS	EDS-123	VA-81A Breaker
EDS	EDS-124	FW-30A Breaker
EDS	EDS-125	HCV-1150A Breaker
EDS	EDS-126	ST-6A Breaker
EDS	EDS-127	D1-NORM Breaker
EDS	EDS-128	D2-EMERG Breaker
EDS	EDS-129	BATT CHG 1 Breaker
EDS	EDS-130	HCV-150 Breaker
EDS	EDS-131	HTR P1-G6 BREAKER
EDS	EDS-1[illegible]2	[illegible]-3A-1 Breaker
EDS	EDS-1[illegible]3	RM-050/051 Breaker
EDS	EDS-[illegible]	HCV-2914 Breaker
EDS	EDS-[illegible]	[illegible]CV-311 Breaker
EDS	EDS-[illegible]	HCV-320 Breaker
[illegible]	EDS-[illegible]	HCV-327 Breaker
EDS	EDS-138	HCV-348 Breaker
EDS	EDS-139	VA-12A Breaker
EDS	EDS-140	VA-2A Breaker
EDS	EDS-141	VA-41 Breaker
EDS	EDS-142	VA-45A Breaker
EDS	EDS-1[illegible]3	VA-46A Breaker
EDS	EDS-144	AC-9A Breaker
EDS	EDS 145	[illegible]O-13A Breaker
EDS	EDS-146	[illegible]-2G-1A Breaker
EDS	EDS-147	[illegible]CV-1905A Breaker
EDS	EDS-148	[illegible]ATT CHG 3 Breaker
EDS	EDS-149	HTR B2-G4 Breaker
EDS	EDS-150	HTR B2-G5 Breaker
EDS	EDS-151	PCV-102-1 Breaker
EDS	EDS-152	CH-4A Breaker
EDS	EDS-153	HCV-265 Breaker
EDS	EDS-154	HCV-268 Breaker
EDS	EDS-155	DW-41A Breaker
EDS	EDS-156	FW-34A Breaker
EDS	EDS-157	VA-24A Breaker
EDS	EDS-158	VA-32A Breaker
EDS	EDS-159	VA-35A Breaker
EDS	EDS-160	V[illegible]40A Breaker
EDS	EDS-161	V[illegible] Breaker
EDS	EDS-162	RCV-[illegible] Breaker
EDS	EDS-163	MOV-EHS Breaker
EDS	EDS-164	LO-12A Breaker
EDS	EDS-165	LO-12C Breaker
EDS	EDS-166	LO-14A Breaker
EDS	EDS-167	LO-14B Breaker

Sys.	Number	Description
EDS	EDS-168	LO-14C Breaker
EDS	EDS-169	LO-3 Breaker
EDS	EDS-170	LO-8 Breaker
EDS	EDS-171	MOV-B Breaker
EDS	EDS-172	MOV-CV Breaker
EDS	EDS-173	MOV-CV2 Breaker
EDS	EDS-174	MOV-CV4 Breaker
EDS	EDS-175	MOV-S1 Breaker
EDS	EDS-176	MOV-SV1 Breaker
EDS	EDS-177	MOV-S2 Breaker
EDS	EDS-178	MOV-SV3 Breaker
EDS	EDS-179	MOV-SV5 Breaker
EDS	EDS-180	MOV-SV7 Breaker
EDS	EDS-181	D1-EMERG Breaker
EDS	EDS-182	D2-NORM Breaker
EDS	EDS-183	BATT CHG 2 Breaker
EDS	EDS-184	HCV-1041C Breaker
EDS	EDS-185	HCV-151 Breaker
EDS	EDS-186	HTR P2-G7 Breaker
EDS	EDS-187	RC-3B-1 Breaker
EDS	EDS-188	HCV-2934 Breaker
EDS	EDS-189	HCV-315 Breaker
EDS	EDS-190	HCV-318 Breaker
EDS	EDS-191	HCV-329 Breaker
EDS	EDS-192	VA-12B Breaker
EDS	EDS-193	VA-2B Breaker
EDS	EDS-194	VA-45B Breaker
EDS	EDS-195	VA-46B Breaker
EDS	EDS-196	CH-4B Breaker
EDS	EDS-197	HCV-258 Breaker
EDS	EDS-198	DW-41B Breaker
EDS	EDS-199	MPP-6 Breaker
EDS	EDS-200	FW-34B Breaker
EDS	EDS-201	RM-060 Breaker
EDS	EDS-202	VA-24B Breaker
EDS	EDS-203	VA-32B Breaker
EDS	EDS-204	VA-35B Breaker
EDS	EDS-205	VA-40B Breaker
EDS	EDS-206	VA-81B Breaker
EDS	EDS-207	HTR B3-G8 Breaker
EDS	EDS-208	HTR B3-G9 Breaker
EDS	EDS-209	PCV-102-2 Breaker
EDS	EDS-210	AC-9B Breaker
EDS	EDS-211	FW-30B Breaker
EDS	EDS-212	HCV-1150B Breaker
EDS	EDS-213	RM-057 Breaker
EDS	EDS-214	HCV-1104 Breaker
EDS	EDS-215	HCV-1384 Breaker
EDS	EDS-216	HCV-1386 Breaker
EDS	EDS-217	HCV-1042C Breaker

Sys.	Number	Description
EDS	EDS-218	HTR B4-G10 Breaker
EDS	EDS-219	HTR B4-G11 Breaker
EDS	EDS-220	HTR B4-G12 Breaker
EDS	EDS-221	RC-3D-1 Breaker
EDS	EDS-222	HCV-2974 Breaker
EDS	EDS-223	HCV-312 Breaker
EDS	EDS-224	HCV-321 Breaker
EDS	EDS-225	HCV-333 Breaker
EDS	EDS-226	DW-43B Breaker
EDS	EDS-227	DW-46B-1 Breaker
EDS	EDS-228	* * * DELETED * * *
EDS	EDS-229	RM-061/062 Breaker
EDS	EDS-230	HCV-347 Breaker
EDS	EDS-231	HCV-383-4 Breaker
EDS	EDS-232	FW-30C Breaker
EDS	EDS-233	HCV-1150C Breaker
EDS	EDS-234	LO-13B Breaker
EDS	EDS-235	EE-2G-1B Breaker
EDS	EDS-236	ST-14 Breaker
EDS	EDS-237	ST-6B Breaker
EDS	EDS-238	HCV-1905B Breaker
EDS	EDS-239	HCV-1905C Breaker
EDS	EDS-240	Rod Drive Control Cabinet Bkr
EDS	EDS-241	AI-179 Breaker
EDS	EDS-242	AI-179/185 Breaker
EDS	EDS-243	LO-4 Breaker
EDS	EDS-244	400 Hz Cab Breaker
EDS	EDS-245	Generator Field Breaker
EDS	EDS-246	LO-12B Breaker
EDS	EDS-247	AI-41B MTS Emerg Sup Feeder Bkr
EDS	EDS-248	AI-41A MTS Emerg Sup Feeder Bkr
EDS	EDS-249	Rod Drive Control Cabinet Bkr
EDS	EDS-250	* * * DELETED * * *
EDS	EDS-251	Bkr 1A11 EDS EDS-252 Bkr 1A13
EDS	EDS-253	Bkr 1A22 EDS EDS-254 Bkr 1A24
EDS	EDS-255	Bkr 1A31 EDS EDS-256 Bkr 1A33
EDS	EDS-257	Bkr 1A42 EDS EDS-258 Bkr 1A44
EDS	EDS-259	Bkr 1B3A EDS EDS-260 Bkr 1B3B
EDS	EDS-261	Bkr 1B3C EDS EDS-262 Bkr 1B4A
EDS	EDS-263	Bkr 1B4B EDS EDS-264 Bkr 1B4C
EDS	EDS-265	Bkr BT-1B3A EDS EDS-266 Bkr BT-1B3B
EDS	EDS-267	Bkr BT-1B3C EDS EDS-268 Bkr BT-1B4A
EDS	EDS-269	Bkr BT-1B4B EDS EDS-270 Bkr BT-1B4C
EDS	EDS-271	1A1/1A3 Swgr Control Power MTS
EDS	EDS-272	1A2/1A4 Swgr Control Power MTS
EDS	EDS-273	1B3A/3A-4A/3B Ctrl Pwr MTS
EDS	EDS-274	1B3B-4B/4A/4B/4C Ctrl Pwr MTS
EDS	EDS-275	1B3C/3C-4C Ctrl Pwr MTS
EDS	EDS-276	AI-133A/D1 Ctrl Pwr MTS
EDS	EDS-277	AI-133B/D2 Ctrl Pwr MTS

Sys.	Number	Description
EDS	EDS-278	D1 Aux MTS
EDS	EDS-279	D2 Aux MTS
EDS	EDS-280	Rod Drive Cabinet Transfer Sw
EDS	EDS-281	Battery 1 Output Breaker
EDS	EDS-282	Battery 2 Output Breaker
EDS	EDS-283	Batt Charger 1 Output to Bus 1
EDS	EDS-284	Batt Charger 3 Output to Bus 1
EDS	EDS-285	Batt Charger 3 Output to Bus 2
EDS	EDS-286	Batt Charger 2 Output to Bus 2
EDS	EDS-304	86/1A11 TRIP SIGNAL
EDS	EDS-305	86/1A31 TRIP SIGNAL
EDS	EDS-306	86/1A22 TRIP SIGNAL
EDS	EDS-307	86/1A42 TRIP SIGNAL
EDS	EDS-308	86/1A13 TRIP SIGNAL
EDS	EDS-309	86/1A33 TRIP SIGNAL
EDS	EDS-310	86/1A24
EDS	EDS-311	86/1A44 TRIP SIGNAL
EDS	EDS-312	86/1A3-TFB TRIP SIGNAL
EDS	EDS-313	86/1A4-TFB TRIP SIGNAL
EHC	EHC-1	Manual Mechanical Trip Lever
EHC	EHC-2	Thrust Bearing Wear Test Switch
EHC	EHC-3	Power Load Unbalance Setpoint
EHC	EHC-4	FV-EHC-1 - EHC Fluid Bypass
EHC	EHC-5	Turbine Hi Vibr Trip Bypass
ESF	ESF-1	A/RC-2A AFAS Bypass Switch
ESF	ESF-2	B/RC-2A AFAS Bypass Switch
ESF	ESF-3	C/RC-2A AFAS Bypass Switch
ESF	ESF-4	D/RC-2A AFAS Bypass Switch
ESF	ESF-5	A/RC-2B AFAS Bypass Switch
ESF	ESF-6	B/RC-2B AFAS Bypass Switch
ESF	ESF-7	C/RC-2B AFAS Bypass Switch
ESF	ESF-8	D/RC-2B AFAS Bypass Switch
ESF	ESF-9	86/AI-43B TRIP SIGNAL
ESF	ESF-10	86/A1-43A TRIP SIGNAL
ESF	ESF-11	86B/CRHS TRIP SIGNAL
ESF	ESF-12	86B/STLS TRIP SIGNAL
ESF	ESF-13	86B/CPHS TRIP SIGNAL
ESF	ESF-14	86B/PPLS TRIP SIGNAL
ESF	ESF-15	86B/VIAS TRIP SIGNAL
ESF	ESF-16	86B/RAS TRIP SIGNAL
ESF	ESF-17	86B/SIAS TRIP SIGNAL
ESF	ESF-18	86B/CSAS TRIP SIGNAL
ESF	ESF-19	86B/OPLS TRIP SIGNAL
ESF	ESF-20	86X/RAS TRIP SIGNAL
ESF	ESF-21	86BX/SIAS TRIP SIGNAL
ESF	ESF-22	86B/CIAS TRIP SIGNAL
ESF	ESF-23	86A1/CRHS TRIP SIGNAL
ESF	ESF-24	86A1/STLS
ESF	ESF-25	86A1/CPHS TRIP SIGNAL
ESF	ESF-26	86A1/PPLS TRIP SIGNAL

Sys.	Number	Description
ESF	ESF-27	86A1/VIAS TRIP SIGNAL
ESF	ESF-28	86A1/RAS TRIP SIGNAL
ESF	ESF-29	86A1/SIAS TRIP SIGNAL
ESF	ESF-30	86A1/CSAS TRIP SIGNAL
ESF	ESF-31	86A1X/RAS TRIP SIGNAL
ESF	ESF-32	86A1X/SIAS TRIP SIGNAL
ESF	ESF-33	86A1/CIAS TRIP SIGNAL
ESF	ESF-34	86A/PPLS TRIP SIGNAL
ESF	ESF-35	86A/CPHS TRIP SIGNAL
ESF	ESF-36	86A/STLS TRIP SIGNAL
ESF	ESF-37	86A/CRHS TRIP SIGNAL
ESF	ESF-38	86A/CSAS TRIP SIGNAL
ESF	ESF-39	86A/SIAS TRIP SIGNAL
ESF	ESF-40	86A/RAS TRIP SIGNAL
ESF	ESF-41	86A/VIAS TRIP SIGNAL
ESF	ESF-42	86A/CIAS TRIP SIGNAL
ESF	ESF-43	86AX/SIAS TRIP SIGNAL
ESF	ESF-44	86AX/RAS TRIP SIGNAL
ESF	ESF-45	86A/OPLS TRIP SIGNAL
ESF	ESF-46	86B1/PPLS TRIP SIGNAL
ESF	ESF-47	86B1/CPHS TRIP SIGNAL
ESF	ESF-48	86B1/STLS TRIP SIGNAL
ESF	ESF-49	86B1/CRHS TRIP SIGNAL
ESF	ESF-50	86B1/CSAS TRIP SIGNAL
ESF	ESF-51	86B1/SIAS TRIP SIGNAL
ESF	ESF-52	86B1/RAS TRIP SIGNAL
ESF	ESF-53	86B1/VIAS TRIP SIGNAL
ESF	ESF-54	86B1/CIAS TRIP SIGNAL
ESF	ESF-55	86B1X/SIAS TRIP SIGNAL
ESF	ESF-56	86B1X/RAS TRIP SIGNAL
ESF	ESF-57	86A/SGLS TRIP SIGNAL
ESF	ESF-58	86B/SGLS TRIP SIGNAL
ESF	ESF-59	86B1/SPARE TRIP SIGNAL
ESF	ESF-60	86A1/SPARE TRIP SIGNAL
FPS	FPS-3	FP-186 - Fire Main to AFW Tank
FWH	FWH-1	FW-992 - LCV-1199 Bypass Valve
FWH	FWH-2	FW-481 - LCV-1199 Isolation Vlv
FWH	FWH-3	FCV-960 - 2nd Stage Extr Byp Vlv
FWH	FWH-4	FCV-964 - 4th Stage Extr Byp Vlv
FWH	FWH-5	FW-723 - MS Drn Tk ST-31A Drn Is
FWH	FWH-6	FW-725 - MS Drn Tk ST-31B Drn Is
FWH	FWH-7	FW-727 - MS Drn Tk ST-31C Drn Is
FWH	FWH-8	FW-729 - MS Drn Tk ST-31D Drn Is
FWH	FWH-9	FW-447 - HP Htr 4A Drain Isol Vv
FWH	FWH-10	FW-448 - HP Htr 4A Drain Isol Vv

Sys.	Number	Description
GEN	EDS-38	DS-T1 - Main Gen Disc Perm
GEN	GEN-9	AI-134 30-1 Acknowledge P/B
GEN	GEN-10	AI-134 30-1 Reset P/B
GEN	GEN-11	86-1/SVG1 TRIP SIGNAL
GEN	GEN-12	86-2/SVG1 TRIP SIGNAL
GEN	GEN-13	86-1/G1 TRIP SIGNAL
GEN	GEN-14	86-2/G1 TRIP SIGNAL
GEN	GEN-15	86-3/G1 TRIP SIGNAL
GEN	GEN-16	86-1/GT1 TRIP SIGNAL
GEN	GEN-17	86-2/GT1 TRIP SIGNAL
GEN	GEN-18	86-3/GT1 TRIP SIGNAL
GEN	GEN-19	AI-134 30-2 Acknowledge P/B
GEN	GEN-20	AI-134 30-2 Reset P/B
HVA	HVA-1	VA-71A Breaker
HVA	HVA-2	VA-71B Breaker
PMP	AFW-15	FW-6 (MDAFP) Local Control
PMP	DWS-1	DW-8A - Wtr Trtmnt Bstr Pump
PMP	DWS-2	DW-8B - Wtr Trtmnt Bstr Pump
PMP	DWS-4	DW-46A - Deaerator Vacuum Pump A
PMP	DWS-5	DW-46B - Deaerator Vacuum Pump B
RCP	RCP-1	86/RC-3A TRIP SIGNAL
RCP	RCP-2	86/RC-3B TRIP SIGNAL
RCP	RCP-3	86/RC-3C TRIP SIGNAL
RCP	RCP-4	86/RC-3D TRIP SIGNAL
RCS	PRS-1	RC-131 - PCV-103-2 Bypass
RCS	PRS-2	RC-133 - PCV-103-1 Bypass
RCS	PRS-3	PCV-2624 - PQT N2 REG SETPOINT
RCS	PRS-4	RC-167 - Pressurizer Vent Valve
RCS	RCS-1	RC-356 - LT-197 Upper Leg Isol
RCS	RCS-2	RC-355 - LT-197 Lower Leg Isol
RCS	WDS-11	HCV-2500 - RCS Hot Leg 1 Sample
RCS	WDS-12	HCV-2502 - Przr Stm Space Sample
RMS	RMS-1	RM-050 Anti-Jam Fuse Interlock
RMS	RMS-2	RM-051 Anti-Jam Fuse Interlock
RMS	RMS-3	RM-052 Anti-Jam Fuse Interlock
RMS	RMS-4	[illegible] Anti-Jam Fuse Interlock
RMS	RMS-5	RM-054A Anti-Jam Fuse Interlock
RMS	RMS-6	RM-054B Anti-Jam Fuse Interlock
RMS	RMS-7	RM-055 Anti-Jam Fuse Interlock
RMS	RMS-8	RM-055A Anti-Jam Fuse Interlock

Sys.	Number	Description
RMS	RMS-9	RM-056A Anti-Jam Fuse Interlock
RMS	RMS-10	RM-056B Anti-Jam Fuse Interlock
RMS	RMS-11	RM-057 Anti-Jam Fuse Interlock
RMS	RMS-12	RM-059 Anti-Jam Fuse Interlock
RMS	RMS-13	RM-060 Anti-Jam Fuse Interlock
RMS	RMS-14	RM-061 Anti-Jam Fuse Interlock
RMS	RMS-15	RM-062 Anti-Jam Fuse Interlock
RMS	RMS-16	RM-063H Anti-Jam Fuse Interlock
RMS	RMS-17	RM-063L Anti-Jam Fuse Interlock
RMS	RMS-18	RM-063M Anti-Jam Fuse Interlock
RMS	RMS-19	RM-064 Anti-Jam Fuse Interlock
RMS	RMS-20	Vent Stack to Rad. Mon.
RMS	RMS-21	RM-050 Warning Alarm Setpoint
RMS	RMS-22	RM-051 Warning Alarm Setpoint
RMS	RMS-23	RM-061 Warning Alarm Setpoint
RMS	RMS-24	RM-070 Warning Alarm Setpoint
RMS	RMS-25	RM-071 Warning Alarm Setpoint
RMS	RMS-26	RM-072 Warning Alarm Setpoint
RMS	RMS-27	RM-073 Warning Alarm Setpoint
RMS	RMS-28	RM-074 Warning Alarm Setpoint
RMS	RMS-29	RM-075 Warning Alarm Setpoint
RMS	RMS-30	RM-080 Warning Alarm Setpoint
RMS	RMS-31	RM-085 Warning Alarm Setpoint
RMS	RMS-32	RM-050 High Alarm Setpoint
RMS	RMS-33	RM-051 High Alarm Setpoint
RMS	RMS-34	RM-061 High Alarm Setpoint
RMS	RMS-35	RM-070 High Alarm Setpoint
RMS	RMS-36	RM-071 High Alarm Setpoint
RMS	RMS-37	RM-072 High Alarm Setpoint
RMS	RMS-38	RM-073 High Alarm Setpoint
RMS	RMS-39	RM-074 High Alarm Setpoint
RMS	RMS-40	RM-075 High Alarm Setpoint
RMS	RMS-41	RM-080 High Alarm Setpoint
RMS	RMS-42	RM-085 High Alarm Setpoint
RPS	RPS-1	86A/DSS TRIP SIGNAL
RPS	RPS-2	86B/DSS TRIP SIGNAL
RRS	PRS-5	"Pzr Htr Bank 4 Gr 10, 11 & 12 Sw"
RRS	RRS-1	CA-909-1 - Air to TCV-909-1
RRS	RRS-2	CA-909-2 - Air to TCV-909-2
RRS	RRS-3	CA-909-3 - Air to TCV-909-3
RRS	RRS-4	CA-909-4 - Air to TCV-909-4
RRS	RRS-5	CA-910 - Air to PCV-910
RWS	RWS-1	FPS to CCW Hx via RWS
SFP	SFP-1	AC-307 - FTC Pp Suction fm SIRWT
SFP	SFP-2	AC-13A - Fuel Xfer Cnl Drn Pp A
SFP	SFP-3	AC-13B - Fuel Xfer Cnl Drn Pp B

Sys.	Number	Description
SFP	SFP-4	AC-5A - SFP Circulating Pump A
SFP	SFP-5	AC-5B - SFP Circulating Pump B
SFP	SFP-6	AC-8 - SFP Hx Isolation Valves
SFP	SFP-7	AC-217 - SFP to SIRWT via WDS
SGB	MIS-6	* * * DELETED * * *
SGB	SGB-1	FW-182 - S/G B to Blowdown Tank
SGB	SGB-2	FW-183 - S/G A to Blowdown Tank
SGB	SGB-3	FW-1052 - S/G B to Blowdown Hx
SGB	SGB-4	FW-1053 - S/G A to Blowdown Hx
SGB	SGB-5	FW-1054 - Blwdwn Hx to Blwdwn Tk
SGB	SGB-6	FW-1055 - Blwdwn Hx to Blwdwn Tk
SGB	SGB-7	FW-215 - Blowdown Pumps to RWS
SGB	SGB-8	WD-890 - Blowdown Pumps to WDS
SGB	SGB-9	AI-107 A42 Acknowledge P/B
SGB	SGB-10	AI-107 A42 Reset P/B
SGB	SGB-11	HCV-2508 - Blwdn Smpl to RWS
SGB	SGB-12	HCV-2509 - Blwdn Smpl to WDS
SGB	SGB-13	AI-186 Lcl Ann Ack P/B
SGB	SGB-14	AI-186 Lcl Ann Reset P/B
SGN	MSS-1	MS-336 - YCV-1045A Byp/Warmup
SGN	MSS-2	MS-337 - YCV-1045B Bypass/Warmup
SGN	MSS-3	MS-338 - HCV-1041A Dwnstrm Drain
SGN	MSS-4	MS-339 - HCV-1041A Upstrm Drain
SGN	MSS-5	MS-341 - HCV-1042A Dwnstrm Drain
SGN	MSS-6	MS-342 - HCV-1042A Upstrm Drain
SIS	SIS-1	SI-185 - Lkg Clr Hdr To SIRWT
SIS	SIS-2	SI-183 - Lkg Clr Hdr To SIRWT
SIS	SIS-3	SI-126 - SI-1A Suct Vlv Frm SDC
SIS	SIS-4	SI-125 - SI-1B Suct Vlv Frm SDC
SIS	SIS-5	SI-152 - SI-3C SIRWT Recrc Isol
SIS	SIS-6	SI-146 - SI-3B SIRWT Recrc Isol
SIS	SIS-7	SI-138 - SI-3A SIRWT Recrc Isol
SIS	SIS-8	SI-132 - SI-1A SIRWT Recrc Isol
SIS	SIS-9	SI-124 - SI-1B SIRWT Recrc Isol
SIS	SIS-10	SI-118 - SI-2A SIRWT Recrc Isol
SIS	SIS-11	SI-111 - SI-2C SIRWT Recrc Isol
SIS	SIS-12	SI-105 - SI-2B SIRWT Recrc Isol
SIS	SIS-13	SI-342 - Lkg Clr Hdr To HPSI
SIS	SIS-14	SI-171 - AC-4A Inlet Isol Valve
SIS	SIS-15	SI-172 - AC-4A Outlet Isol Vlv
SIS	SIS-16	SI-167 - AC-4B Inlet Isol Valve
SIS	SIS-17	SI-168 - AC-4B Outlet Isol Vlv
SIS	SIS-18	SI-170 - AC-4A/4B Inlt X-Tie Is
SIS	SIS-19	SI-169 - AC-4A/4B Inlt X-Tie Is
SIS	SIS-20	SI-174 - AC-4A/4B Otlt X-Tie Is
SIS	SIS-21	SI-173 - AC-4A/4B Otlt X-Tie Is
SIS	SIS-22	SI-178 - Cntmt Spray Isol Valve
SIS	SIS-23	SI-177 - Cntmt Spray Isol Valve

Sys.	Number	Description
SIS	SIS-24	SI-186 - SDC Warmup Valve
SIS	SIS-25	NG-173 - SI-6C Vent Cap
SIS	SIS-26	NG-174 - SI-6D Vent Cap
SIS	SIS-27	NG-172 - SI-6B Vent Cap
SIS	SIS-28	NG-171 - SI-6A Vent Cap
SWD	EDS-287	3451-2 - 345 KV Breaker
SWD	EDS-288	3451-6 - 345 KV Breaker
SWD	EDS-289	DS-T1A-1 - Xfmr T1A-1 Disconnect
SWD	EDS-290	DS-T1A-2 - Xfmr T1A-2 Disconnect
SWD	EDS-291	DS-T1A-3 - Xfmr T1A-3 Disconnect
SWD	EDS-292	DS-T1A-4 - Xfmr T1A-4 Disconnect
SWD	EDS-293	Transfer Trip Signal Channel 1
SWD	EDS-294	Transfer Trip Signal Channel 2
SWD	EDS-297	86-1/T1A-3 TRIP SIGNAL
SWD	EDS-298	86-2/T1A-3 TRIP SIGNAL
SWD	EDS-299	86-1/T1A-4 TRIP SIGNAL
SWD	EDS-300	86-2/T1A-4 TRIP SIGNAL
SWD	EDS-301	86-2/BF4 TRIP SIGNAL
SWD	EDS-302	86-2/BF5 TRIP SIGNAL
SWD	EDS-303	86/161 TRIP SIGNAL
SYN	EDS-295	22 KV Fast Transfer Block
SYN	EDS-296	161 KV Fast Transfer Block
TGA	GEN-1	Gen H2 Supply Manifold Pressure
TGA	GEN-2	Gen CO2 Supply Manifold Pressure
TGA	GEN-3	TGA-H2 - Gen H2 Fill/Vent Valve
TGA	GEN-4	TGA-CO2 - Gen CO2 Fill/Vent Vlv
TGA	GEN-5	Y-01 - Inlet to Pump ST-6A
TGA	GEN-6	Y-02 - Inlet to Pump ST-6B
TGA	GEN-7	Bus Duct Clng Fan Motor Select
TGA	GEN-8	20-27 - Gen H2 Analyzer Vent
TLO	TUR-3	Turbine Oil Reservoir Fill Valve
TUR	TUR-1	MS-308 - Main Steam to Gland Sl
TUR	TUR-2	SSFV - Glnd Sl Stm Reg Stpt
TUR	TUR-4	Turning Gear Jog Pushbutton
VLV	AFW-11	YCV-1045 - Auto/Manual Select
VLV	AFW-12	YCV-1045 - Mn Stm to FW-10
VLV	AFW-13	HCV-1384 - LOCAL/REMOTE SELECT
VLV	AFW-14	HCV-1384 - AFW to Main FW Hdr
VLV	AFW-17	HCV-1107B - Auto/Manual Select
VLV	AFW-18	HCV-1107B - AFW to S/G RC-2A
VLV	AFW-19	HCV-1108B - Auto/Manual Select
VLV	AFW-20	HCV-1108B - AFW to S/G RC-2B

Sys.	Number	Description
WDS	WDS-1	WD-2A - 250 GPM RCDT Pump
WDS	WDS-2	WD-2B - 50 GPM RCDT Pump
WDS	WDS-3	WD-465 - WHU Tank C Drain Valve
WDS	WDS-4	WD-879 - WHU Tank C Inlet Isol
WDS	WDS-5	WD-843 - Waste Header to SIRWT
WDS	WDS-6	WD-137 - N2 to Gas Decay Tk Isol
WDS	WDS-7	FCV-532C - WGDT to Vent Stack
WDS	WDS-8	WD-28A - Waste Gas Compr A
WDS	WDS-9	WD-28B - Waste Gas Compr B
WDS	WDS-10	RC-124 - RCS Loop Drain to RCDT
WDS	WDS-13	* * * Deleted * * *
WDS	WDS-14	NG-124 - N2 to RCDT Isol. Vlv
WDS	WDS-15	WD-352 - Spnt Rgn Tk 13A Drn Vlv
WDS	WDS-16	AI-100 A50 Acknowledge P/B
WDS	WDS-17	AI-100 A50 Reset P/B
WDS	WDS-18	AI-100 A51 Acknowledge P/B
WDS	WDS-19	AI-100 A51 Reset P/B
WDS	WDS-20	AI-100 A52 Acknowledge P/B
WDS	WDS-21	AI-100 A52 Reset P/B

1.3(4) Additional Special Instructor/Training Features Available

Freeze/Run

It is possible to interrupt (Freeze) and restart (Run) the simulator dynamics but retain the I/O to the panel instrumentation from any console. Freeze will be accomplished by selecting FRZ. When the simulator is in the freeze mode, the RUN/FRZ soft key will be reverse video blue with RUN inscribed on the key. The run function will be accomplished by selecting RUN. When the simulator is running, the RUN/FRZ soft key will be reverse video green with FRZ inscribed on the key.

Backtrack

A backtrack disk file contains the historical snapshots of simulator conditions to allow the instructor to back up and restart the simulator from some time back during the training session. Backtrack initialization is identical to normal initialization. The simulator automatically records its condition during the training session and stores that status at regular time intervals. Disk space for 240 historical snapshots is provided. A circular buffer arrangement will make the latest minutes of operation be represented by the numerically earliest backtrack snapshots. The circular buffer arrangement is not affected by resetting to any IC including backtrack ICs so that records are not lost.

Snapshot

The snapshot capability of the simulator enables the instructor to write an initial condition, or snapshot, of current power plant status and conditions including malfunctions, local operator actions, global component failures, plant parameters, overrides, and remote control unit assignments by storing the necessary information

Snapshot (continued)

in a rotating buffer using IC locations 55-59. It is possible to move the contents of one of these snapshot buffer ICs to any other IC position (I-54). Password protection can be used for protected IC's.

Replay

The replay feature provides the instructor with the capability to freeze the simulation and replay a period of recent history of simulator operation on all control panel readouts. Plant computer systems and computerized displays are not included in the replay function.

While in this mode of operation, the system will not respond to any operator actions. However, while in replay the system will respond to FRZ and RUN control inputs. Slow time operation of replay can be selected by the instructor, up to 1/10 of real time.

This replay is a semi-dynamic simulation; all of the simulator models function normally, except for the control panel inputs. Instead of receiving control manipulations from the boards, the simulation task receives inputs from the stored history of operator manipulations. Thus, starting from one of the backtrack snapshots, the instructor is able to go back to the time represented by that backtrack snapshot and exactly repeat all of the students' actions and plant responses during that period.

This replay feature has the advantage of being able to be stopped at any point in the operations of the replay, and resuming normal simulator operation with this exact stopping point being the initial condition. This capability enables the instructor to reach any

Replay (continued)

instant of the recent history of the simulator operation exactly, taking into consideration all control board and instructor inputs. The snapshot feature is active during the replay operation, as will many of the monitoring displays.

During the replay function, the instructor can send a history of operator and instructor actions to a printer, or monitor them in the activity window on the control CRT. The information contained in this history includes the time of each specific action, the associated plant tag number or instructor system reference, a description of the affected component, and the status change.

Override Control

A number of override features are provided to simulate simple failures of control room equipment. These overrides include the following generic types:

- Digital output override to simulate:
  - Freezing any digital input in its current status
  - Permanent failure of switches to a selectable position
  - Permanent failure of push-buttons in the open or closed contact state
- Analog input override to simulate permanent failure of any analog input, freezing of the input in its current value, or drifting to a specified value with a specified ramp time.
- Annunciator override to simulate failure of any hardwired control board annunciator freezing in its current status, or causing the annunciator to be permanently on or off.
- Digital output override to simulate failure of any on/off light in its current status or to cause the light to be permanently on or off.

Override Control (continued)

- Analog output override to simulate failure of any output, freezing in its current position, or drifting to a specified value with a specified ramp value and ramp time.

Plant Performance Parameter Control

The instructor is able to change external and internal plant parameters. External plant parameters are those which are outside the control of the plant, but which have dynamic effects on the plant simulation.

Internal parameters are those which are state variables within individual models which have been identified during the preliminary design review and are subject to change by the instructor.

Time Scaling

A time scaling feature is provided with the system. This feature addresses both a fast and slow time mode of operation.

A fast time mode of operation is provided to allow the instructor to accelerate certain plant dynamics which have long time constants. This speedup allows up to 10 times real time. Activating the time scaling feature at the main instructor's station causes a menu to appear at the control CRT allowing the following dynamics to be adjusted for fast time:

- Xenon and samarium concentration and decay heat
- RCS heatup
- RCS cooldown
- Turbine system heatup
- Turbine system cooldown
- Drawing condenser vacuum
- Pressurizer bubble formation

Time Scaling (continued)

The instructor can select any one or any combination of these dynamics for fast time mode of operation; he can select any integral factor between 1 and 10 times real-time for each item individually. The dynamics of the selected items speed up while other plant dynamics remain in real time. The control panel input/output system operates at the same frequency as real time. Those plant parameters affected by the fast time dynamics indicate the effects on the control panels and on instructor's console monitoring displays.

A slow time mode of operation is provided to allow the instructor to slow down all plant dynamics from 10% to 100% of real time in 10% steps. All plant simulation calculations are executed at a correspondingly slower frequency. However, the control panel input/output system operates in the same frequency as in real time to provide realism. All control panel indicators work properly during slow time operation. Indicators show corresponding slower changes in analog values. Alarm flashing occurs at its normal frequency. An analog smoothing feature may be started to smooth analog outputs to the control board during slow time operation.

Drill Library

The instructor may select exercises from a library of preprogrammed lesson drills or exercises which will automatically step the simulator through a set of predefined operations and controls. The library can contain up to 100 drills with up to 25 actions in each. Titles and comments can be included in drill files. This computer-assisted exercise feature minimizes simulator setup and manipulations by the instructor, and provides standard, repeatable, and preplanned exercises for training.

Datapool Monitoring

The instructor is able to monitor the status of up to 64 parameters on the monitor CRT by selecting the DATAPOOL soft key. The monitor display has four parameter value fields to a line, with the appropriate datapool variable name prefacing each value field. Lines are grouped together with spaces between groups to enhance legibility.

Plant Status Displays

This CRT display will provide an alphanumeric presentation of status information for plant system variables in "log sheet" format. The instructor can page between 10 discrete pages of 20 variable per page.

Plant Diagrams

Plant diagrams, accessed with the P&IDs soft keys allow the instructor to review and monitor the simulator status via special graphic displays on the control or monitor CRTs. A menu of available diagrams is provided along with a convenient control and paging structure. After the desired system diagram has been selected, the proper display will appear on the CRT and the dynamic information will be updated once every second. Up to 64 dynamic fields may appear on each diagram. Colors, symbols, and numeric fields can all be dynamically changed by association with process values in Datapool. It is possible to select malfunctions, LOAs, plant parameters, and global component failures on these displays.

Parameter Trending

Using the monitor display, the instructor is able to monitor trends of four variables versus time distributed over 20 pages, four variables on each page. A four hour historical data file with values stored at one second increments is available with each variable. This trending task continuously updates when the simulator is in the run mode.

The instructor may change the monitored variables, their range, or alarm setpoints at any time through the option menu. The trends may be printed out on a color printer to provide a hard copy.

Trainee Performance Review

Trainee performance review capability includes:

- Logging of up to 80 monitored parameters to a disk file once per second for up to four hours (those previously selected per section 4.4, Trends).
- Logging of all control panel manipulations and instructor directed actions (as described in section 3.6, Replay).
- Capability to transfer data collected in disk files to tape.
- Trend display generation of monitored parameters from stored history that was logged to the disk file.
- Printer reports available for each class to supplement trend displays.

1.4 OPERATIONAL PROCEDURES

All the procedures used on the Fort Calhoun simulator are the procedures used in the operation of the reference plant. Procedures used in the simulat.r are updated at the same time as the plant procedures.

All drawings used in the simulator control room are controlled documents maintained in the same manner as the drawings used in the reference plant.

Differences between the simulator control room and the reference plant that impact procedure performance are discussed with the trainees by the simulator instructors as the procedure is performed.

1.5 CHANGES SINCE LAST REPORT

This is Fort Calhoun Station's initial report.

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION

Simulator Certification Submittal

Section 2

2.1 INTRODUCTION

The purpose of this Section is to describe the process and documentation used for design scope and modelling of the Fort Calhoun Station (FCS) Full Scope Simulator. The design process is described in Section 2.2. Section 2.3 (and appendices) details the design documents.

2.2 DESIGN PROCESS

A multi-disciplined core group of personnel established a simulator design team, with the mission of defining the desired final product. The core membership of this team included specialists in Plant Operations, Engineering, and Nuclear Plant Simulation Modelling. (For the specific core design team member qualifications, see Appendix 2.A). The steps used in the aforementioned definition included the following major steps, detailed below:

- Determination of Simulator Scope
- Development of a Simulator Design Specification
- Data Collection and Review
- Vendor/Customer Simulator Scope Meetings
- Simulator Design Reviews
- Development and Implementation of Simulator Configuration Management Program

2.2.1 Determination of Simulator Scope

The first part of this step consisted of bounding the scope of simulation based on FCS Operator Training needs. Identification and subsequent definition of operator training needs was in progress pursuant to Job and Task Analysis (JTA) for accreditation of the OPPD Operator Training Program by the Institute of Nuclear Power Operations. The JTA was made simulator-specific by discussions of procedure-based tasks held between

2.2.1 Determination of Simulator Scope (continued)

members of the simulator design team and FCS plant operators. The results collated from the simulator-specific JTA provided the basis for marking up FCS Piping and Instrumentation Diagrams (P&ID's) to reflect the operator-based preliminary scope of simulation.

Subsequent portions of Simulator Scope Determination consisted of refining the preliminary scope. This refinement included the development of modelling assumptions and simplifications, as well as preparation of the following lists:

- Malfunctions
- Local Operator Actions (LOA's)
- Plant Performance Parameters
- External Parameters
- Critical and Monitored Parameters
- Initial Conditions

2.2.2 Simulator Data Collection

With the scope of simulation defined as described above, data collection for use in the simulator model could proceed. The first step in the data collection effort was that of identifying and evaluating data to facilitate the writing of an accurate simulator specification to put out for bid. The simulator design team reviewed FCS System Descriptions, the Updated Safety Analysis Report (USAR), and evaluated pending plant design changes to establish system design bases and system characteristics. The Control Room Inventory portion of the Integrated Control Room Design Review Report was used to provide data on control board legend plates, instrument characteristics (i.e., types, ranges, scales), system mimics, and panel demarcations and color padding.

2.2.2 Simulator Data Collection (continued)

Following the award of the simulator contract to Westinghouse Electric Corporation, and at the behest of Westinghouse, the simulator design team collected operational plant data. This data collection effort consisted of three phases. Reference plant data was collected during actual plant maneuvers, such as plant startup, shutdown, and to the extent actual plant data was available, during plant transients. The data included, in addition to selected plant parameter printouts, strip charts, and log readings, video taping and still photographs of all simulated control panel instrumentation at various power levels. The video tapes and photographs were for Westinghouse use for panel fabrication, determination of I/O devices, and as reference power level instrument readings.

2.2.3 Simulator Design Reviews

The initial step in this phase of the design effort consisted of simulator scope review meetings between the OPPD Simulator Design Team and Westinghouse personnel. The purpose of these meetings was to further hone the scope definition. The meetings consisted of reviews of the submitted scope P&ID's (discussed above) and additional P&ID annotation to correlate the locations of listed Malfunctions, LOA's, and Plant Performance Parameters.

Periodic design reviews were conducted by the design team during simulator construction to ensure complete, correct implementation of the simulator specification. Among these were comprehensive reviews of the Preliminary, and later the Interim Design Basis Documentation packages prepared by Westinghouse. The need for additional documentation, assumed or surrogate plant data identified during the design process was tracked by generation of Data Void Requests, issued by Westinghouse. Data Voids remained open until the requested data was provided.

2.2.4 Simulator Configuration Management

A Configuration Management System (CMS) was established to maintain control of design data for all systems and components in the simulator. The CMS consists of databases of references for all source documents provided to Westinghouse by OPPD, and the uses of those documents by simulated systems and components. This CMS is maintained current with as-built plant conditions and plant design changes by frequent review and updates.

2.3 SIMULATOR DESIGN DOCUMENTATION

The simulator Design Basis Documents (DBD's) are presented in Appendix 2.B. The DBD's describe the simulation of each modelled system, including the following information:

- System Purpose(s) and Description
- System Design Bases
- Discussion of System Simulation

A summary of the design data documents used in development of the simulator models, grouped by system or component handler (i.e., pump, valve) is presented in Appendix 2.C. This summary contains, as available, the following information for source documents:

- Alphanumeric Identifier
- Title
- Issuing Agency
- OPPD Aperture Card Number

Appendix 2.C is not intended to be an all-inclusive reference list. Document sheet numbers and revision/change numbers used specifically for simulation development have been intentionally omitted from this summary

2.3 SIMULATOR DESIGN DOCUMENTATION (continued)

in the interest of brevity. The CMS databases, however, contain all pertinent document identification information. Additional documentation data from the CMS databases are available upon request.

APPENDIX 2.A

SIMULATOR DESIGN TEAM CORE MEMBER QUALIFICATIONS

The following personnel formed the core of the simulator design team:

- Richard P. Clemens, P.E., B.S. Electrical, Supervisor - OPPD Simulator Services
- Mark Gutierrez, B.S. EET, Former FCS Shift Technical Advisor, OPPD
- J. B. Michael, Former FCS Operations Shift Supervisor (Senior Reactor Operator), OPPD
- Skip Searfoss, Senior Consultant, Interfacts, Inc.

APPENDIX 2.B

SIMULATOR DESIGN BASIS DOCUMENTATION

Reactor Core System Functional Description

Description of Simulated System

The purpose of the reactor core is to generate heat to be used in the formation of steam in the steam generators. The core is the primary heat source in the Nuclear Steam Supply System (NSSS). Heat generated as a result of fission is transferred from the fuel rods to the Reactor Coolant System. This heat is then used to heat water in the steam generators to form steam.

The core consists of 133 fuel assemblies. The fuel assemblies are approximately 8 inches square, with the active fuel region being approximately 10 feet long. Each fuel assembly consists of a 14 x 14 matrix of fuel pins with five 4-pin groups of pins missing where the control element assembly (CEA) guide tubes are placed. This leaves 176 fuel pins in each assembly. Placed in certain of the CEA guide tubes are either CEAs (49), flow plugs (4), neutron sources (2), or incore detectors (28). Approximately one-third of the fuel in the core is removed and replaced with new fuel on an 18 month-based cycle.

There are 49 CEAs, moved by 37 Control Element Drive Mechanisms (CEDMs). These are grouped into three general categories (shutdown, regulating, and non-trippable CEAs), subdivided into a total of seven groups; shutdown groups A and B, regulating groups 1 through 4, and non-trippable group N. The 24 shutdown group CEAs are moved by 12 CEDMs. The CEDMs for the shutdown and regulating CEAs are identical. The remaining CEAs have non-trippable CEDMs.

Each CEA is comprised of five fingers which are one inch in diameter and 153 inches long and tied together at the top with a "spider". The CEA is joined to the extension shaft of the CEDM with an internal expandable collet. Each finger of the CEA is filled with 120 inches of boron carbide pellets, with 8 inches of Ag-In-Cd at the lower tip. A gas expansion space is provided to accommodate the helium gas and moisture given off by the boron carbide during operation. This expansion space eliminates the probability of sticking or binding of the control rod fingers in a CEA guide tube due to swelling.

Incore neutron detectors are inserted into the core at 28 selected fuel assembly locations. Each detector assembly consists of four neutron flux detectors stacked vertically, and one thermocouple at the assembly outlet.

The neutron detectors are self-powered rhodium detectors; the thermocouples are chromel-alumel.

Axial spacing of the detectors in each assembly and radial spacing of the assemblies permit representative neutron flux mapping of the core and monitoring of the fuel assembly coolant outlet temperature.

Excore detectors are grouped into four wide range channels, four power range safety channels, and two power range control channels. The wide range (logarithmic) channels indicate neutron flux over more than 12 decades from source level to above full power. They are located approximately every 90° around the reactor core, in cavities physically outside of the reactor vessel. The power range channels provide an output signal in the range of 0 to 200 percent power. The power range detectors are also located approximately every 90° around the core in instrument thimbles in the biological shield.

Components and Functions Simulated Elsewhere

The positions of the shutdown, regulating, and non-trippable CEAs are determined by the Control Rod Drive (CRD) model.

Boron concentration is simulated in the Reactor Coolant System model.

Nuclear instrumentation is handled by two different models. The excore detection system is modeled in the Nuclear Instrumentation System model, while the incore detection system is modeled in the Incore Instrumentation model.

The heated Junction Thermocouples are simulated by the Reactor Coolant System model.

Activity simulation and transport is simulated in the Radiation Monitoring System model.

Components and Functions Not Simulated

Heat generation from the metal-water reactions is *not* simulated.

Control Rod Drive System Functional Description

Description of Simulated System

The purpose of the Control Rod Drive (CRD) system is to provide a means to move the Control Element Assemblies (CEAs) into/out of the reactor core. This movement of the CEAs is necessary to bring the reactor critical, dampen axial power oscillations, or quickly bring the reactor subcritical upon a reactor trip signal. Power changes are not generally accomplished with the CEAs. Power changes are made with, and fuel depletion is compensated for, by reactor coolant system boron concentration changes. Experience has shown that operation with the CEAs controlled manually and fully withdrawn significantly extends fuel clad integrity and also optimizes fuel depletion.

There are 49 CEAs that are moved by 37 Control Element Drive Mechanisms (CEDMs). There are seven groups of CEAs divided into three general groups; shutdown CEAs, regulating CEAs, and non-trippable CEAs. The shutdown groups are identified as groups A and B; the regulating groups are identified as groups 1, 2, 3, and 4; and the non-trippable group as group N. The 24 shutdown group A and B CEAs are yoked together in pairs and moved by 12 CEDMs. The 21 regulating group CEAs are each moved by their own CEDM.

The CEDMs for the shutdown and regulating CEAs are identical. The four group N CEAs each have a non-trippable CEDM.

The CEDM drive motors insert and withdraw the CEAs upon receipt of a signal from the manual control switch (joystick) on the main control board. A manual or automatic reactor trip will interrupt power to the clutches of the trippable CEDMs and gravity will cause the CEAs to fall into the core. There are two clutches installed in the CEDM. The lowest one is an anti-reverse rotation clutch that was designed to prevent inadvertent upward CEA motion, and to drive down any stuck CEAs after a reactor trip. The more important of the two clutches is the upper clutch, the trip clutch. The trip clutch transfers forward and reverse torques from the CEDM drive motor to the drive shaft. The clutch has two toothed sections. When the 52 VDC clutch power is applied, the lower section rises and engages the teeth of the driving section. A reactor trip signal removes the clutch power from the electro-magnet located in the upper section of the trip clutch, thus allowing gravity to pull the lower section away, disengaging the clutch teeth. The lower portion of the clutch, the drive shaft, and the pinion gear rotate as the control rod falls in.

The non-trippable CEDMs have a solid shaft that replaces the trip clutch and the anti-reverse clutch.

The CEDM drive motor is an AC synchronous motor that will run in either direction. This requires that a forward and a reverse starting circuit be used. When 120 VAC is applied to either the raise or lower start circuit, that same current is converted to 90 VDC and applied to an electromagnet that retracts the motor brake, and permits either forward or reverse motor rotation. The motor speed is reduced and torque is multiplied by a reduction gear between the motor and clutches. Drive shaft speed is only 8 RPM, corresponding to a rod speed of 46 inches per minute. When tripped, the CEAs must travel from fully withdrawn to at least 90% insertion in 2.5 seconds or less.

There are three different methods of CEA position indication that the CEDMs provide; reed switch position indication, synchro position indication, and limit switch position indication.

The synchro indication and the reed switch indication are used for position readout, and are considered to be the primary and secondary position indications, respectively. The limit switch indication is used primarily for control rather than indication, and is therefore not considered a form of position indication.

The synchro indication is driven with a sending unit that is geared to the CEDM drive shaft. The receiving units are mounted on the main control board. The 128 inches of CEA travel cause a corresponding 264 degree rotation of the synchro units. The synchros are accurate to ±0.5 inch. The synchro position is also supplied to the plant computer for logging and control purposes.

The reed switch indication uses 65 reed switches in a 130-inch string for each CEDM. The reed switches are located in a conduit outside of the pressure housing of the CEDM and are actuated by a permanent magnet inside the pressure housing that closes the reed switch that is in closest proximity to it. The reed switches are accurate to +2 inches.

Limit switch indication utilizes six cam lobes on the shaft between the primary synchro and the synchro gear drive. The cam lobes actuate nine switches for core mimic and other light indications, as well as control functions.

Components and Functions Simulated Elsewhere

The nuclear effects of the CEAs moving into or out of the core are simulated in the Reactor Core model.

The clutch power supplies and their control are simulated in the Reactor Protective System model.

The Reactor Regulating System computes rod movement demand signals for each individual rod.

The CRD model only computes rod positions; the signals representing the reed switch outputs and the synchro transmitter outputs are generated in the Instrument Channel Handler (ICH) from these rod positions; SCEAPIS selects from these to perform its control and display functions; the Reactor Regulating System model also selects from these signals to drive the synchro indicators.

The limit switches are modeled in the Reactor Regulating System model. The status of the CEDM drive motor power supply is determined in the Inplant Electrical Distribution System model.

Components and Functions Not Simulated

Coupling or uncoupling of the CEAs from the CEDMs is not simulated.

The manual lock function of the CEDM drive package is not simulated.

Reactor Coolant System Functional Description

Description of Simulated System

The major components of the Reactor Coolant System (RCS) are the reactor vessel, two parallel heat transfer loops, each containing one steam generator and two reactor coolant pumps, and a pressurizer connected to one of the reactor vessel outlet (hot leg) pipes. All components are located inside the containment building.

During normal operation, reactor coolant is circulated through the reactor vessel and steam generators by the reactor coolant pumps. The coolant is heated as it passes through the active region of the core and transfers that heat to the secondary system in the steam generators. The coolant also serves as a neutron moderator in the core and contains a soluble neutron absorber (boric acid) for reactivity control.

The system also includes the reactor coolant gas vent system which provides paths for venting the reactor vessel head and the pressurizer to the Pressurizer Quench Tank (PQT) or the containment atmosphere.

A boron concentration model is also included as part of the RCS model.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler, based on data received from this model.

The pressurizer quench tank and associated piping are simulated in the Pressurizer Quench Tank (PQT) model.

The reactor coolant pumps are simulated in the Reactor Coolant Pump (RCP) model.

Heat generation/transfer from the core is computed in the Reactor Core (RXC) model.

Activity inventory and transport are modeled in the Radiation Monitoring System (RMS) model.

The Reactor Vessel Level Indication System (RVLIS) is a part of the Qualified Safety Parameter Display System (QSPDS).

Incore nuclear instrumentation is simulated in the Incore Nuclear Instrumentation (ICI) model.

The Heated Junction Thermocouples (HJTCs) are simulated in the ICI model.

The control signals for pressurizer level control are computed in the Reactor Regulating System (RRS) model.

The control signals for pressurizer pressure control and pressurizer heater heat flux are computed in the RRS model.

Components and Functions Not Simulated

All major components and functions are simulated. Only one loop drain is simulated.

Removal of the reactor head for refueling is not simulated.

Reactor Coolant Pump System Functional Description

Description of Simulated System

The Reactor Coolant Pumps (RCPs) (two per steam generator) provide the motive force to move the reactor coolant water through the Reactor Coolant System (RCS). They also provide the driving head for the pressurizer spray (from loops 1B and 2A) during normal operation. The water transports heat from the reactor core to the steam generator tubes.

During plant startup, the reactor coolant pumps supply thermal energy to heat up the Reactor Coolant System. During plant shutdown/ cooldown, the reactor coolant pumps provide flow to maintain a uniform temperature distribution throughout the Reactor Coolant System. (Pressurizer spray is provided by the charging pumps via aux spray when the reactor coolant pumps are unavailable.)

The reactor coolant pumps are vertical shaft, single suction, single stage centrifugal pumps, driven by 4160 volt electric motors with flywheels. Each pump is equipped with multistage mechanical face seals and a single self-aligning, water lubricated bearing mounted above the pump impeller. The pump has three impellers.

The main impeller provides coolant flow. The auxiliary impeller, cast as part of the main impeller, maintains a low pressure on the inside of the hydrostatic bearing; this has the same effect as supplying a pressurized fluid to the journal face. The hydrostatic bearing is thereby lubricated, and able to keep the shaft from wobbling. Additional shaft support is provided by the driver motor bearings. The third impeller is an acme thread attached to the shaft.

The screw action of the thread recirculates 40 gpm of reactor coolant through the seal heat exchanger and around the seal cartridge. One gpm of this recirculating water is continually leaking up through the seals and is replenished by one gpm leaking up between the shaft and the thermal barrier.

The shaft seal system is composed of four mechanical seals that are lubricated and cooled by the controlled reactor coolant leakoff. The first three seals are tandem-mounted, and are designed to withstand full RCS pressure, while allowing a controlled leakage of coolant (approximately one gpm) into the seal assembly. The fourth seal, also capable of withstanding full RCS pressure, is designed to be a vapor seal.

Reactor coolant flows up the shaft, past the thermal barrier, and through a heat exchanger to be cooled before it enters the area of the first stage seal.

The heat exchanger maintains approximately 130° F at the seal inlet with the design seal leakage flow of between .75 and 1.25 gpm when the pressure breakdown seals are functioning properly. Flow is controlled by labyrinth flow restrictors designed to divide the total pressure drop across three high pressure seals. By dividing the pressure drop, each seal normally sees only 700 psid, thereby extending the seal's operating lifetime. The fourth seal virtually eliminates any leakage to the containment atmosphere, and typically is less than 0.3 gph.

Controlled bleedoff past the third seal is ducted by a header to the volume control tank. Controlled bleedoff past the fourth seal is directed to the reactor coolant drain tank (RCDT). During periods of containment isolation, the controlled bleedoff flow is also directed to the RCDT.

The pump driving motors are air cooled, three phase induction motors, which employ flywheels to increase their coastdown time in the event of loss of power to the motor.

The motors are designed for continuous operation, and accelerate from a dead stop to operating speed under full load when 90 percent or more of the rated voltage of 4000 volts is applied at its terminals. The motors have anti-reverse rotation clutches. These keep the pump from rotating in the reverse direction when idle, permit starting an idle pump when voltage is low, and help to minimize reverse flow.

Each pump has a startup and a running lube oil system. The startup system uses a high pressure and a low pressure oil lift pump to supply oil to the anti-reverse rotation clutch radial bearing and to position the motor/pump shaft axially. Oil lift pressure must be high enough to satisfy starting interlocks for the pump start circuit. Once the pump attains 90 percent of rated speed, the lift pumps stop (they would restart if speed dropped below 90 percent) and the thrust bearing runner acts like an impeller to supply oil flow to the lube oil cooler and the anti-reverse rotation device. The lift pumps must also be in operation if flow is lost to the anti-reverse rotation devices. The upper and lower guide bearings are immersed in oil, and don't need forced lubrication. The external oil cooler cools oil used by the upper guide bearing, the thrust bearing, and the anti-reverse rotation device. The lower bearing oil is cooled by a cooling coil located within the lower oil reservoir.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Actual reactor coolant flow through the pumps themselves is modeled in the RCS model.

Components and Functions Not Simulated

Normal oil leakage from the reactor coolant pumps is not modeled; only the leak flows resulting from the oil reservoir and oil cooler leak malfunctions (RCP-1 and RCP-5) are modeled.

The stator winding heaters are not modeled; the control logic is implemented, and the currents will be calculated.

Pump gasket bleedoff flow to the RCDT is not modeled.

Flushing and venting of the RCP seals is not modeled.

Pressurizer Quench Tank System Functional Description

Description of Simulated System

The Pressurizer Quench Tank (PQT) is a horizontal right circular cylindrical vessel located within the containment structure. Its primary purpose is to prevent the escape of potentially radioactive steam released from the pressurizer via its PORVs or safeties from entering the containment atmosphere. This function is achieved by maintaining the tank approximately two-thirds full of water, and terminating the tail pipe from the reliefs and safeties inside the tank below the water level.

The tank also receives discharges from several other reliefs/ safeties throughout the primary plant. Also, an interconnection to the RCDT allows draining of the tank, while a connection to the Demineralized Water System permits cool makeup water to be sprayed into the gas space of the tank to reduce pressure in the tank. A connection to the bottled gas system allows a nitrogen blanket to be applied to the gas space of the tank. The gas space can also be vented, either to the waste gas compressors via HCV-155 (and HCV-507A and 507B), or through the gas analyzer flow path (HCV-509A and HCV-509B).

The tank is protected against catastrophic failure resulting from overpressurization by a relief valve (RC-125) which relieves to the containment floor, and by a rupture disk which vents the tank's gas space to containment atmosphere.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Components and Functions Not Simulated

The gas analyzer is not simulated. Any gas vented through HCV-509A and HCV-509B is lost from inventory.

Steam Generator System Functional Description

Description of Simulated System

The steam generators serve as the heat sink for the primary system. Under normal operating conditions, the steam generators supply steam for use in the main turbine generator.

In other modes of operation, steam flow can be directed to the main condensers (steam dump or turbine bypass) or directly to the atmosphere. Each steam generator is also capable of supplying steam to the turbine-driven auxiliary feed pump and to the turbine gland sealing system.

The system consists of two vertically mounted U-tube steam generators; for each steam generator, a steam line containing safety, relief, stop, and drain valves, traps, and the instrumentation necessary to carry out the functions described above; and a common steam header.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The supply of water for the steam generators comes from the Condensate and Feedwater (CFW) model or the Auxiliary Feedwater (AFW) model.

Heat and fluid transport on the primary side of the U-tubes are computed by the Reactor Coolant System (RCS) model.

Steam generator blowdown processes are modeled in the Steam Generator Blowdown (SGB) model.

Control signals for the steam dump and turbine bypass valves modeled herein are generated in the Reactor Regulating System (RRS) model.

The turbine stop and governor valves are modeled in the Main Turbine (TUR) model.

The AFW turbine governor valve is modeled in the Auxiliary Feedwater (AFW) model.

Radiation monitoring and activity transport are performed by the Radiation Monitoring System (RMS) model.

Components and Functions Not Simulated

All major system components, flowpaths, and functions are modeled, either within SGN or as described above.

Steam Generator Blowdown System Functional Description

Description of Simulated System

The Steam Generator Blowdown System (SGB) consists of two separate blowdown lines, each connected to its respective steam generator. Each line, having valves and instrumentation, leads to a common heat exchanger which cools the effluent before it flows to the blowdown tank. The common heat exchanger is modeled, but is not utilized. Flow from blowdown flows directly to the blowdown tank. The tank is pumped via either steam generator blowdown pump to the Waste Disposal System (WDS) for processing or to the Raw Water System (RWS) for discharge to the river.

The Steam Generator Blowdown System provides a means of controlling steam generator chemistry, draining the steam generators for dry layup conditions, and removing radioactive contaminants from the steam generators in the event of a primary to secondary leak.

A portion of the blowdown flow is continuously routed to the sampling area for sampling and monitoring. Only the flow and radiation monitoring instrumentation are simulated.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Components and Functions Not Simulated

The SGBPS, consisting of the blowdown demineralizers and the spent resin holding tanks together with their associated piping, pumps, and instrumentation, is not simulated.

The blowdown sample heat exchanger, sample headers, and chemistry analyzers are not simulated.

Chemical Volume and Control System Functional Description

Description of Simulated System

The Chemical and Volume Control System (CVCS) consists of three charging pumps, a volume control tank, two concentrated boric acid storage tanks, ion exchangers, a letdown heat exchanger, a regenerative heat exchanger, a purification filter, a boronometer, process radiation monitors, control valves, instrumentation, and interconnecting piping.

The normal flow path of reactor coolant through the chemical and volume control system is from RCS loop 2A through the tube side of the regenerative heat exchanger for an initial temperature reduction. The cooled fluid then passes through the letdown flow control valve(s) to the letdown heat exchanger where the final reduction to operating temperature takes place.

The pressure of the fluid in the letdown heat exchanger is maintained by the letdown backpressure control valve, through which the fluid flows on its way to the ion exchanger(s). It then passes through a filter and is sprayed into the volume control tank.

The charging pumps take suction from the volume control tank and pump the coolant through the shell side of the regenerative heat exchanger (for recovery of heat from the letdown flow) and back to the reactor coolant system via loops 1A and 2A cold legs. An auxiliary spray flow line to the pressurizer is also provided, as well as a cross-connect to the HPSI header at the charging pumps' discharge.

The volume control tank's level and boron concentration are controlled by feeding makeup liquid from the makeup system and/or diverting letdown flow to the waste disposal system.

Toward the end of a core cycle, deborating ion exchangers are also used. In addition, ion exchangers are used to remove soluble nuclides and insoluble particles.

Hydrogen overpressure is maintained in the VCT to control oxygen. Excess gasses are vented to the waste gas system.

The reactor coolant pump mechanical seal controlled leakage is piped to the VCT.

The instruments, controls, pumps, valves alarms, and other equipment simulated are listed in tables and are depicted schematically on the system diagram located in the simulator Final Design Data Base documents.

All major flow paths are modeled.

In order to allow the instructor to establish realistic plant conditions, Plant Performance Parameters (PPPs) and Local Operator Actions (LOAs) are provided. PPPs CVC-1 through CVC-3 allow the instructor to set the boron concentration of the various ion exchangers in the letdown system. Although the ion exchangers will not exhaust during the course of simulation, the RCS boron concentration malfunction will set the ion exchanger boron concentration to the malfunction value. PPPs CVC-4 and CVC-5 allow the instructor to set the boron concentration of the concentrated boric acid tanks. Makeup to the BATs is accomplished via LOAs, CVC-17 and CVC-18. Each activation of either of these LOAs will cause an 11 percent increase in level of its corresponding BAT (as though the contents of the batch tank were being added), at the current specified value of boron concentration for that tank.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Components and Functions Not Simulated

All major components and flow paths are modeled as stated above. The following items are not modeled:

Resin addition tank

Boric acid batching tank end strainer

Chemical addition tank

Chemical addition flow path

Letdown strainer

Boric acid filter

Metering pump and flow path

Aging of the ion exchangers is not modeled

Only one of each type of ion exchanger and purification filter is modeled.

Safety Injection System Functional Description

Description of Simulated System

The Safety Injection System, as defined for the Fort Calhoun Simulator, performs the following functions.

Provide emergency core cooling following a loss of coolant accident for any break size up to and including a double ended rupture of the 32-inch ID hot leg.

Provide rapid injection of borated water for added shutdown capability during a rapid cooldown of the Reactor Coolant System following a main steamline break.

Low pressure safety injection (LPSI) pumps and shutdown cooling heat exchangers are used during plant cooldown to remove core decay heat and reactor coolant system stored heat. Following cooldown they are used to maintain a constant Reactor Coolant System temperature while the plant is at cold shutdown or while conducting refueling operations.

Maintain the core covered with borated water for extended periods of time by recirculating containment sump water to the Reactor Coolant System following a loss of coolant accident.

Provide a means of cooling containment spray water following a recirculation actuation signal (RAS).

Provide a means to fill and drain the safety injection tanks.

Limit the containment structure pressure rise by providing a means for cooling the containment atmosphere following a loss of coolant accident.

Control reactor coolant temperature during normal startup in the range of ambient to less than 300F.

The major components of the SIS are the safety injection and refueling water tank (SIRWT), three high pressure safety injection (HPSI) pumps, two low pressure safety injection (LPSI) pumps, three containment spray pumps, two shutdown cooling heat exchangers, four safety injection tanks, eight high pressure injection valves, four low pressure injection valves, and a dual set of containment spray headers and nozzles.

During normal operation, the Safety Injection System is maintained in a standby mode with all of its components aligned for automatic emergency operation.

Upon receiving a safety injection actuation signal (SIAS), which actuates the diesel sequencers, all of the safety injection and spray pumps will start via the sequencers. The HPSI and LPSI injection valves will also automatically open. The containment spray valves will not open until receipt of a containment spray actuation signal (CSAS). During the injection mode of operation, all of the pumps take suction from the SIRWT and inject borated water at refueling boron concentration into the Reactor Coolant System.

The SIRWT would continue to provide water until its level dropped low enough to actuate the SIRWT low signal (STLS), which in turn actuates RAS if either the pressurizer pressure low signal (PPLS) or the containment pressure high signal (CPHS) is present. When RAS is received, the suction of the pumps is automatically switched over to the containment building floor, the LPSI pumps are stopped, the pump minimum recirculation valves are shut, and full cooling flow is cut into the shutdown cooling heat exchangers. Once initiated, recirculation will continue until terminated or modified by operator action.

Upon receiving a CSAS, the containment spray header valves would open, and bring the containment spray system to full operation. During the recirculation mode, the containment spray water is cooled by the shutdown cooling heat exchangers prior to discharge back into the containment atmosphere. The Containment Spray System is redundant to the containment air recirculation, cooling, and iodine removal system (within CNM) for the containment cooling function.

When the reactor coolant system pressure drops below approximately 250 psig, the four safety injection tanks will discharge their contents into the primary coolant system.

The safety injection tanks are a passive injection system since no electrical signal, operator action, or outside power source is required for the tanks to perform their function.

Between the safety injection tanks and the reactor coolant loops are double pipe, helical coil type heat exchangers. They are designed to condense and cool any leakage from the safety injection check valves. These heat exchangers work in conjunction with a pressure control valve to accept inleakage from the Reactor Coolant System and return it to either the volume control tank (CVC) or the reactor coolant drain tank (WDS).

After the Reactor Coolant System pressure has dropped low enough, the Safety Injection System is aligned for shutdown cooling. Alignment consists of blocking CSAS, isolating the safety injection tanks, and ensuring the Safety Injection Actuation Signals are blocked.

After the proper valve lineups are performed, a LPSI injection valve to a loop with a running reactor coolant pump is cracked open and the system is heated to equalization temperature with the Reactor Coolant System. The shutdown cooling system flow, along with component cooling water flow to the heat exchangers, is then set to achieve the desired cooldown rate. During shutdown cooling, the LPSI pumps take suction from the Reactor Coolant System through a nozzle on the hot leg in loop 2. The shutdown cooling flow is injected back into the Reactor Coolant System through the four safety injection nozzles on the cold legs. This nozzle arrangement makes the shutdown cooling flow pass through the core in the normal direction. The shutdown cooling capability may also be used during the early stages of plant startup to control the reactor coolant temperature.

Another system interface is a connection that is provided from the discharge side of the charging pumps (CVC) to the redundant HPSI header. Its primary purpose is to test the operation of the four safety injection check valves at the primary loops when the Reactor Coolant System is pressurized. The connection can also be used to correct boron concentrations in the safety injection tanks, as well as providing an alternate injection path for the charging pumps.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

All accident signal logic and actuation is modeled in the Engineered Safeguards model (ESF).

Containment ambient conditions relating to safety injection/spray are modeled in the Containment model (CNM).

Safety injection pump bearing coolers are modeled in the Component Cooling Water model (CCW).

Chemical and Volume Control system functions relating to the Safety Injection System are modeled in the Chemical and Volume Control model (CVC).

Components and Functions Not Simulated

Refueling cavity filling/draining is not modeled.

Shutdown cooling purification is not modeled.

Alternate spent fuel pool cooling is not modeled.

Safety injection system sampling is not modeled.

Safety injection pump discharge drains to WDS are not modeled.

Safety injection pump flushing is not modeled.

Trisodium phosphate dodecahydrate maintained in the containment sump for pH control is not simulated.

Component Cooling Water System Functional Description

Description of Simulated System

The Component Cooling Water System (CCW), is a closed-loop cooling system consisting of three pumps, four heat exchangers, a surge tank, and the valves and instrumentation which may be operated and monitored from the simulated control room.

It provides cooling to the following components/heat loads:

Letdown non-regenerative heat exchanger
Reactor coolant pump lube oil coolers
Reactor coolant pump seal coolers
Charging pump oil coolers
CEDM seal coolers
Waste evaporator package
Containment air cooling and filtering unit coils
Containment air cooling units
Safety injection tank leakage coolers
Control room air conditioning units
Nuclear detector well coolers
Spent fuel pool heat exchanger
Waste gas compressor seal water heat exchangers
Shutdown cooling heat exchangers
Containment spray pump bearing coolers
Low pressure SI pump bearing coolers
High pressure SI pump bearing coolers

Interconnections with the Raw Water System provide a backup cooling supply to the following components:

Containment spray pump bearing coolers
Low pressure SI pump bearing coolers
High pressure SI pump bearing coolers

Containment air cooling and filtering unit coils
Containment air cooling units
Control room air conditioning units

An interconnection with the Bottled Gas System provides the capability of pressurizing the surge tank with a nitrogen blanket. Since the components which are cooled by CCW carry radioactive or potentially radioactive fluids, the system is continuously monitored for radioactivity which may have leaked into the system from the components being cooled.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Activity transport is performed by the Radiation Monitoring System model based on flow rates computed by this model.

Components and Functions Not Simulated

The sampling heat exchangers are not simulated.

The dechromate tank and associated water chemistry are not simulated.

Containment System Functional Description

Description of Simulated System

The Containment model, as defined for the Fort Calhoun simulator, performs a number of functions. These functions are listed below:

Cools and filters containment atmosphere to minimize contamination buildup via VA-3A, VA-3B, VA-7C, and VA-7D.

Reduces fission product inventory by filtration in the event of a DBA via VA-3A and VA-3B.

Restricts leakage of airborne activity from the containment in the event of a DBA.

Purges the potential accumulation of hydrogen concentrations within the containment via purge units VA-80A and VA-80B. These units are simulated logically based on valve positions, power, and differential pressure.

Forces cooling of the seismic skirt to ensure adequate cooling of the control element drive motors (CEDMs) via cooling units VA-2A and VA-2B.

Cools the nuclear detectors situated in the nuclear detector wells via units VA-12A and VA-12B.

Maintains the concrete temperatures in the concrete shielding surrounding the reactor vessel to below 150° F.

Allows the controlled relief of pressure buildup within the containment structure.

Purges to supply fresh air and rid the containment of noble gasses prior to personnel access for shutdowns and maintenance outages via VA-24A, VA-24B, VA-32A, VA- 32B, VA-77, and VA-76.

Monitors hydrogen buildup under accident conditions via hydrogen analyzers VA- 81A and VA-81B.

The containment system consists of fans, cooling units, dampers, and various instrumentation which can be remotely operated and monitored from the control room.

Fluid leakages, mass and energy balances (including RCS and SGN heat transfer to containment) and hydrogen buildup are simulated in the containment space model.

The temperature of the containment atmosphere will be calculated in the containment model and will be sent to the various instrumentation in the associated system to account for instrument error, e.g., pressurizer level in RCS and steam generator level in SGN.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model. The radiation monitors are modeled in their respective system.

Components and Functions Not Simulated

The various filters are not explicitly modeled.

Demineralized Water System Functional Description

Description of Simulated System

The Demineralized Water System (DWS) takes raw river water from either the screenhouse pump cells (via the raw water pumps), or from the circulating water discharge tunnel (via the raw water supply pump) and provides clarified water to the potable water tank (and thus to the fire protection system) and to the Bearing Cooling Water System as an alternate cooling supply to the air compressors.

This system provides the demineralized water for makeup to the auxiliary feedwater storage tank, the main condenser (via the condensate storage tank), the primary water storage tank, and the bearing cooling water head tank.

It also provides demineralized and deaerated makeup water to the CVC makeup system, the CCW surge tank, and the pressurizer quench tank.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Components and Function Not Simulated

The chemical treatment facilities are not simulated.

The chemistry of the water in the DWS model is not simulated; it is assumed to always be within specification.

Makeup to the drip and drain tank is not simulated.

Station usage from the potable water tank is not simulated.

The flow path to the Boric Acid Batch Tank is simulated; however, since the tank is not modeled in the CVC model, any water sent through this path is lost from inventory.

The supply of demineralized water to containment via valves HCV-1559A and B is not simulated. The control logic for the valves is simulated to provide proper indication on the control boards.

Waste Disposal System Functional Description

Description of Simulated System

The Waste Disposal System (WDS) collects liquid waste streams and liquid flows resulting from leaks (induced by malfunctions) in the containment and auxiliary building which may be subject to radioactive contamination. Gaseous wastes are also collected from the VCT and PQT. It also collects non-contaminated leak flows in the turbine building.

Storage facilities are provided for both the liquid and gaseous wastes until they can be monitored for controlled release or processed for disposal.

This system consists of tanks, pumps, compressors, sumps, valves, interconnecting piping, and instrumentation which may be remotely operated and monitored from the control room.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers. Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Activity transport is performed by the Radiation Monitoring System model based on flow rates computed by this model.

The containment sump is modeled in the Containment model.

Components and Functions Not Simulated

The Stressing Tunnel Sump is not simulated.

The Waste Neutralization Tank (and associated piping) is not simulated.

The Fuel Transfer Canal is not simulated.

Hotel wastes are not simulated. Waste processing equipment is not simulated; it is assumed to work perfectly when required, with the only observable result being a reduction in stored waste inventory.

In most cases, only one of a group of redundant components is simulated. The remainder are either not simulated, (eg. redundant sump pumps), or an IDA is provided to allow the instructor to establish the appearance of the existence of the non-simulated components (such as the gas decay tanks and waste hold-up tanks).

Spent Fuel Pool System Functional Description

Description of Simulated System

The Spent Fuel Pool System basically has two purposes. The first and most important purpose is to remove decay heat from spent fuel assemblies stored in the storage pool and to transfer the heat to the Component Cooling Water System, thus keeping the spent fuel pool's temperature below Technical Specification limits. The second purpose is to control and maintain the chemistry and clarity of the storage pool water.

The system consists of two transfer canal drain pumps that can be used to make up to the storage pool, the storage pool itself, two storage pool circulation pumps, a heat exchanger, a demineralizer, and a filter. The associated valves and piping to connect the components together are also included. The system is manually operated, and has no pneumatic or electrically actuated valves.

The heat exchanger (AC-8), is cooled by component cooling water, and is used to keep the storage pool below Technical Specification temperature limits. Cooling is controlled by manually throttling component cooling water to the heat exchanger. The heat exchanger is in parallel with the demineralizer (AC-7), and the filter (AC-6). In this way, some of the pool recirculation flow can be diverted through the demineralizer/filter to keep the water clarity and purity within specification.

Components and Functions Simulated Elsewhere

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The supply of water for the spent fuel pool make-up is taken from the Safety Injection Refueling Water Tank (SIRWT). This tank is modeled in the SIS system.

Cooling water for the spent fuel pool heat exchanger is supplied by the CCW system. Temperature control of the SFP heat exchanger is performed by using an LOA to throttle CCW flow.

The radiological implications of lowering pool level (increased area radiation), and overflowing the pool or leakage due to malfunction SFP-2 (increased airborne activity in the auxiliary building), are accomplished in the RMS model based on inputs from this model.

Components and Functions Not Simulated

The multiple suction paths from either the surface of the pool through a strainer or from the middle of the pool are not modeled; only the path from the middle of the pool is modeled. The strainer is not modeled.

The back-up cooling path using a cross connection to the Shutdown Cooling System and flexible spool pieces is not modeled. This is because this path depends upon altering the state of certain locked safety related valves in the shutdown cooling and safety injection systems. Therefore, this path cannot be used during normal operations or when there is fuel in the reactor vessel. These conditions exceed the extent of simulation.

Flow paths to the waste disposal system are not modeled. The flow path from the Reactor Coolant Drain Tank pumps that is used to clarify the refueling cavity is also not modeled.

The number and power history of fuel elements stored in the fuel pool are not simulated, however, the heat load in the pool is an instructor-selectable Plant Performance Parameter.

Bottled Gas System Functional Description

Description of Simulated System

The Bottled Gas System supplies pure nitrogen or hydrogen gas at regulated pressure to various plant systems for use primarily as a cover gas in their associated tanks.

The gas supply bottles are simulated as infinite-capacity sources at pressures selectable by the instructor via Local Operator Actions (LOAs). The instructor can simulate isolation of the bottle(s) by setting the respective pressure to zero. The setpoints of the nitrogen pressure reducing valves PCV-2625 and PCV-2606 are also adjustable by the instructor via LOAs.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards are implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The individual shutoff valves and regulators serving individual tanks are modeled in the subroutine which models the tank in order to improve the numerical stability of the models.

Components and Functions Not Simulated

The regulators and/or shutoff valves at the gas bottles are not simulated, as the instructor can emulate their operation by setting the source pressure to the desired value via LOAs.

Main Turbine System Functional Description

Description of Simulated System

The system consists of the main turbine and the associated piping from the main steam header to the main condenser. The main flow path is from the main steam header through the turbine stop and control valves into the high pressure turbine. From the high pressure turbine, the flow splits and enters four parallel moisture separators, then passes through the combined intermediate (i.e., intermediate stop and intercept) valves before entering the two double-flow parallel low pressure turbines.

The exhaust from the low pressure turbines exits directly into the main condenser. Secondary flow paths include the extraction steamlines from various stages of the turbine, the turbine inlet valves and piping drain lines, the turbine crossover relief lines, and the turbine gland seal steam piping.

The turbine is a thirteen-stage, tandem compounded non-reheat unit. At rated operation, it runs at 1800 rpm with a guaranteed rating of 481,477 kW and a maximum design rating of 501,143 kW at 1500 MWt. For warming the turbine during startup, a poppet valve is provided internal to stop valve 2.

The four moisture separators are of the vane-type, single pass design. Each separator has its own drain collecting tank which in turn drains to the heater drain tank or dumps directly to the main condenser.

The steam space of each turbine section is sealed from the outside atmosphere where the shaft penetrates the shell by a low pressure gland seal steam system, which prevents steam leakage out of the high pressure turbine, and air leakage into the low pressure turbine. During startup, shutdown, and low load operation, sealing steam is supplied directly from the main steamlines upstream of the main turbine stop valves.

Once the turbine is in operation, leakage from the high pressure glands supplies the needs of the system. Excess steam is dumped to the shell sides of the No. 1A and 1B feedwater heaters. The gland seal steam system has two relief valves which are modeled as one valve.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The Main Turbine Control System is simulated in the turbine Electrohydraulic Control model (EHC).

The main generator is modeled in the Main Generator model (GEN).

The turbine lubricating oil system is modeled in the Turbine Lubricating Oil model (TLO).

Instrumentation and monitoring functions unique to the turbine are modeled in the Turbine Supervisory Instrumentation model (TSI). Cooling and seal oil for the generator are modeled in the Turbine Generator Auxiliaries model (TGA).

The remainder of the extraction steam system is simulated in the Feedwater Heaters, Vents, and Drain model (FWH).

Components and Functions Not Simulated

The steam packing exhauster (ST-4) is not modeled.

Auxiliary Steam System Functional Description

Description of Simulated System

The Auxiliary Steam System (AXS) model consists of an oil fired boiler (operable in on-off fashion by the instructor via an LOA) which provides a backup source of steam to the following components when sixth-stage extraction steam is not available from the main turbine:

Building heating coils
Gas stripper
Waste evaporator
Condensate storage tank
Caustic tank heaters
Domestic hot water generator

Since these "hotel" loads are not modeled, the instructor is provided with a Plant Performance Parameter to set the steam load for the system.

The model also includes the instrumentation necessary for monitoring the system and valves and traps for controlling the interface from the main turbine.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The normal extraction steam supply to the hotel loads is modeled in the Main Turbine model (TUR).

Components and Functions Not Simulated

The individual heaters/components which receive steam from the Auxiliary Steam System are not simulated; the instructor varies the steam load through the use of a Plant Performance Parameter.

The fuel oil system is not modeled. As long as the instructor turns the boiler on, sufficient fuel is assumed to exist.

Turbine Electrohydraulic Control System Functional Description

Description of Simulated System

The Electrohydraulic Control System (EHC) controls the amount of electrical load carried by the main turbine generator. It also governs the speed, acceleration, and loading rate of the main turbine generator. The system is composed of speed, load, and valve position control units.

The speed control unit compares actual turbine speed with a reference speed signal. The output of the speed control unit is a speed error signal that is input to the load control unit.

The acceleration control unit compares actual turbine acceleration with a reference acceleration rate signal. The output of the acceleration control unit is an acceleration error signal that is input to the load control unit.

The load control unit combines the speed error signal with the load set signal, plus various limit signals and biases, to produce the load reference signal.

The load reference signal is applied to the valve positioning units which develop it into individual positioning signals for their respective turbine steam flow control valves.

The system operates the four turbine control valves, turbine stop valves, and combined stop/intercept valves.

The system also provides for valve testing at power.

Each control valve and its associated stop valve are tested together, and both normal and fast acting devices are tested. Each intercept valve and its associated intermediate stop valve are tested the same as the above control valve.

The Emergency Trip Fluid System (ETS) includes a hydraulic power unit that provides pressurized hydraulic fluid to open the turbine steam admission valves. Any trip of the protection system will remove the pressure and trip the main and intermediate stop valves directly, and the control and intercept valves indirectly. The ETS system consists of a fluid reservoir, redundant pumps and fluid coolers, and accumulators.

Directly associated with the ETS system is the turbine protection system, which automatically trips the turbine upon receipt of any of the following trip signals:

Loss of Vacuum
Turbine Overspeed
Turbine Backup Overspeed
Reactor Trip
Main Generator Field Breaker Trip
Main Steam Isolation Valves Shut
Main Generator Trip
Main Generator Disconnect Open
Primary Speed Signal Lost
Backup Speed Signal Lost
Loss of Main Generator Stator Cooling
Turbine High Vibration
Moisture Separator High Level
Turbine Exhaust Hood High Temperature
Loss of Turbine Lube Oil Pressure
Low ETS System Hydraulic Pressure
Loss of D.C. Power From AI-41A (Breaker 4)
Low Pressure Signal from the Thrust Bearing Wear Detector
Manual Trip

The chest/shell warming logic allows for gradual warming of the valve chest and high pressure shell by admitting steam through a small pilot valve built into the disk of stop valve #2. This minimizes the differential temperature of the metal and steam, thereby minimizing thermal stresses.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers, with the exception of the turbine stop valves, control valves, and combined intermediate stop/intercept valves.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Components and Functions Not Simulated

Only those portions of the turbine control system necessary to simulation operation are modeled.

Turbine Supervisory Instrumentation System Functional Description

Description of Simulated System

The Turbine Supervisory Instrumentation System (TSI), as defined for the Fort Calhoun simulator, models the turbine-related instrumentation that is not included in the Main Turbine (TUR) or Turbine Electrohydraulic Control (EHC) systems.

The instrumented parameters computed by this model include individual bearing metal temperatures, individual bearing lubricating oil exit temperatures, individual journal bearing vibration levels, a synthesized bearing vibration phase angle, rotor, shell and differential expansion values, eccentricity, control valve bowl temperatures, and turbine shell casing temperatures. These parameters are then passed to other routines for display, control, and alarms.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The exhaust hood temperatures are computed in the Condensate and Feedwater model (CFW).

Bearing lubricating oil flows and inlet temperatures are computed in the Turbine Lubricating Oil model (TLO). Turbine shaft speed, generator output power, and turbine steam properties are computed in the Main Turbine model (TUR).

Supply steam properties are computed in the Steam Generator model (SGN).

Components and Functions Not Simulated

The shaft phase angle, and consequently the bearing vibration phase angle, are not explicitly computed. A vibration phase angle signal is synthesized for display purposes only.

Condensate and Feedwater System Functional Description

Description of Simulated System

The Condensate and Feedwater System (CFW), returns the condensed, preheated steam cycle condensate to the Steam Generators.

Steam exhausted from each low pressure turbine is condensed in its respective condenser. The condensate thus produced drains to a hotwell located at the bottom of each condenser. The condensate is then supplied to the suction of three condensate pumps having minimum flow requirements.

The condensate passes through the condensate cooler and then through stator and hydrogen coolers. Flow is controlled through these coolers by a bypass flow via TCV-1180 and HCV-1160. The condensate is then directed to the steam packing exhauster and is supplied to the tube side of the drain coolers. The flow then passes through two parallel heater trains, each containing five low pressure heaters, and is then delivered to the steam generator feed pumps' suctions.

Connections upstream of the fifth heater in each train are provided to receive the discharge from the heater drain tank pumps.

The three steam generator feed pumps operate to increase the pressure of the condensate and supply it to the steam generators. Connected to the discharge of each feed pump is a minimum recirculation flow control valve that can direct flow to the main condenser to insure minimum flow requirements for each pump.

The outlet of each pump connects to a common header which supplies two parallel high pressure heaters. The flow passes through flow nozzles and flow control valves which are controlled by the three-element feedwater regulating system during normal operation. The system functions to maintain the mass flow rate into the steam generator equal to the mass flow rate out of the steam generator while keeping the steam generator level at a programmed level. The feedwater then flows through motor-operated stop valves and into the steam generators.

The main vacuum pumps have two modes of operation, hogging and holding. The proper mode is determined by condenser pressure. The performance of the vacuum pumps is dependent on bearing cooling water temperature.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

All thermal effects of the feedwater heaters on the condensate are calculated in the Feedwater Heaters model (FWH).

The radiological effects in the condensate and feedwater system, including the detection by RM-057, will be modeled in the Radiation Monitoring System (RMS).

Components and Functions Not Simulated

Secondary side water chemistry is not modeled, except for conductivity.

The main feedwater pump lube oil systems are not dynamically simulated.

Feedwater Heaters, Vents & Drains System Functional Description

Description of Simulated System

The Feedwater Heater System (FWH), is primarily used to heat condensate and feedwater prior to pumping the water back into the steam generators.

The heater system consists of a pair of drain coolers, five pairs of low pressure feedwater heaters, and a pair of high pressure feedwater heaters. The drains from these heaters are created by the condensing of steam extracted from various stages of the main turbine. Water drained from the turbine crossover steam separators is also collected by this system. The cascaded drains are all collected in a tank and then pumped back into the condensate system under normal operation. Levels of water in the heaters are maintained within pre- determined limits. Under abnormal conditions, the drains can be diverted directly to the condensers.

The heater drain system is a cascade-type system, which means that the heaters gravity drain from the highest to the lowest heater within each train. One train of heaters drains from heater #6 to #5 to #4 to the heater drain tank. From the heater drain tank, the contents are pumped back into the condensate header between heaters 4A and 5A and/ or 4B and 5B.

Drains also flow within a train from heater #3 to #2 to #1 to a level control tank to one of the drain coolers, and then into the respective condenser. All heaters, except 4A and 4B, have a backup level control valve, which is operated by a level controller on the heater's shell side to dump excess water directly to the condenser. Drain valves prevent flooding of the heaters, which could lead to water backing up into the turbines through the steam extraction lines.

The main steam moisture separators drain to their respective drain collecting tanks, and then to the heater drain tank. The collecting tanks function to maintain a water seal between the moisture separators and the heater drain tank to prevent steam blow-by to the heater drain tank. Each collecting tank has its own level controller to maintain operating level. Each tank also has a backup level controller that operates a level control valve. This control valve drains directly to the condenser to maintain water level should the normal level controller fail.

The heater drain tank collects and stores condensate drainage from the four moisture separator drain tanks, heaters 4A, 4B, 5A, 5B, 6A, and 6B, and serves as a water source for the heater drain pumps. Heater drain tank level is controlled by two different level controllers.

The heater drain pumps take suction on the heater drain tank and pump drain condensate to the condensate system. Each pump has its own recirculation valve which directs pump discharge water to the condenser to cool its pump during low flow conditions.

The drains from heaters 3A and 3B cascade down through heaters 2A and 2B, and 1A and 1B, to the level control tanks. These tanks are used as seal tanks to keep the drain coolers full of water, which prevents steam blow-by to the main condenser. The water then flows from the drain coolers into the main condenser.

Extraction steam bypass valves are used to remove moisture from the extraction lines during periods of no extraction steam flow in the supply lines, even though the system is operating. The extraction bypass valves for the second and fourth stage extraction lines have steam traps in parallel with the valves; the sixth stage extraction line has a trap only.

If leak isolation of heaters is necessary, plant power must be reduced. Power level must be within the capacity of the remaining operating heaters in the drain path to prevent level control problems in the operating heaters. Failure of a heater drain tank, moisture separator drain tank, or level control tank level controller would cause control to be maintained by the backup level controller for the respective unit. The heater drain tank also has a manually operated level control valve that can be used in conjunction with the backup level control valve.

To simplify the thermal interface, this model also computes all of the temperatures on the condensate side of the heaters, starting at the drain cooler inlet.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Malfunctions representing feedwater heater tube leaks have their flows calculated in the Condensate and Feedwater System (CFW).

Malfunctions representing failures of the various level controllers are implemented in the Controller Handler (CNH) via global failures.

The moisture separators are modeled in the in the Main Turbine model (TUR).

Extraction steam flow to the Auxiliary Steam System is modeled in the Main Turbine model (TUR).

Components and Functions Not Simulated

Local control of the heater level control valves from panels AI-121 or AI-122 is not explicitly modeled. All of the level control valves can be failed by the instructor (using global failures) to emulate this function. Switches and controls at AI-121 and AI-122 are not included in the simulator process diagrams.

The feedwater heater vents to the main condensers are not explicitly modeled.

The heater drain tank pressure relief and drains to the heater drain pump suction trench are not modeled.

The heater drain pump vents back to the heater drain tank are not modeled.

Auxiliary Feedwater System Functional Description

Description of Simulated System

The Auxiliary Feedwater (AFW) system is used for three functions:

To provide an alternate supply of feedwater to the steam generators in the event of low steam generator water level.

To provide a source of feedwater during system heatup and cooldown operations.

To provide a source of feedwater during hot standby operation.

The system is designed to add feedwater to either steam generator under any condition, including the loss of all electrical power along with the loss of the main feedwater system and the loss of the main steam piping downstream of the main steam isolation valves.

The auxiliary feedwater system is considered to be that equipment required to store, pump and deliver makeup water to the steam generators to remove decay heat in the event the normal equipment is not available. The system consists of one emergency feedwater storage tank (FW-19), one motor-driven (FW-6) and one turbine-driven (FW-10) auxiliary feedwater pump, remotely operated flow control valves, interconnecting piping to the main feedwater system and piping to the auxiliary feed nozzles in the steam generators.

FW-6 is operated during reactor and steam plant heatup, and during reactor startup until the reactor reaches the point of adding heat. When reactor power is between zero and five percent of full power, a main feedwater pump is started, and FW-6 is shutdown and placed in a standby condition. The turbine-driven auxiliary feedwater pump (FW-10) is not normally used during plant heatup due to the fact that its use of steam as a driver represents a heat loss and slows the plant heatup rate.

During plant shutdown, the main feedwater pumps are used to feed the steam generators until the plant heat loads and decay heat load are within the capacity of FW-6. When plant heat loads permit, FW-6 is started and the main feed pumps are stopped. FW-10 is not normally used during plant shutdowns. It is only used occasionally to demonstrate operability.

In the event of an auto initiation of auxiliary feedwater, the auxiliary feedwater system is designed to automatically start both auxiliary feedwater pumps. Actual flow to the steam generators will be directed to the intact steam generator(s).

When both auxiliary feedwater pumps are operating, the mode of control is such that FW-10 will not be discharging water to the steam generators unless FW-6 is pumping at its maximum output. The reason is that the speed of FW-10 is regulated to keep its discharge pressure approximately 40 psi greater than steam header pressure.

FW-6 is a constant speed pump and its discharge pressure is controlled by the feedwater header restrictions so that, as flow is throttled down, the discharge pressure increases to an ultimate shutoff head of about 1200 psi. The steam header pressure is maintained automatically by the steam dump and turbine bypass system at about 900 psi. Therefore, FW-10, which senses auxiliary feedwater header and steam line pressures, will be idling and not pumping into the auxiliary feedwater header until the auxiliary feedwater header pressure is within 40 psi of the steam header pressure

Due to the above described control dissimilarity, FW-10 is usually stopped and placed in standby after the transient stabilizes and FW-6 is used to maintain the steam generator water level.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The fill valves for the Emergency Feedwater Storage Tank (EFWST), LCV-1189 and LCV-1173, are modeled in their respective system models (DWS and CFW).

The boundary of the crosstie to the main feedwater system is at the main feed header, downstream of the crosstie check valve FW-1334.

The logic computations for automatic actuation of the auxiliary feedwater system's components (including malfunction AFW-6) is performed in the Engineered Safeguards model (ESF).
The feedwater pump turbine steam supply valve (YCV-1045) is modeled in the SGN model.

Components and Functions Not Simulated

The isolation valves for the motor operated crosstie valve, HCV-1384, are not simulated. They are redundant to HCV-1384, and used primarily for maintenance purposes.

The redundant EFWST isolation valve, FW-1316, is also not simulated. The suction path from the tank is adequately modeled with one valve.

The recirculation flow path back to the main condenser is not modeled.

The lube oil cooler for FW-10 is not modeled.

Raw Water System Functional Description

Description of Simulated System

The Raw Water System (RWS), is a two loop, once through circulating water system consisting of four pumps, four heat exchangers, valves, piping, and instrumentation which may be remotely operated and monitored from the control room. The system is manifolded and valved to allow interconnection of the loops during all modes of operation.

The raw water system provides screened and strained river water to the component cooling water heat exchangers for cooling (CCW) and to the demineralized water system for makeup (DWS), during normal operation.

It also provides water for direct cooling of various engineered safeguards components in the unlikely event that all component cooling water pumps and heat exchangers are unavailable to fulfill their design functions. The engineered safeguards components include the shutdown cooling heat exchangers, control room air conditioning heat exchangers, containment air cooling and filtering units, high pressure safety injection pump lube oil coolers, low pressure safety injection pump lube oil coolers, and the containment spray pump lube oil coolers.

In addition, drainage and discharge to the raw water system is simulated from overflow and drainage of the emergency feedwater storage tank, discharge from the blowdown tank transfer pumps, and discharge from the steam generator portion of the sampling system.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The heat exchangers for shutdown cooling (AC-4A and -4B), containment cooling (VA-1A and -1B and VA-8A and -8B), safety injection (SI-1A, -1B and SI-2A, -2B, -2C), containment spray (AC-3A, -3B, and -3C), and control room air conditioning (VA-46A and -46B) are modeled in their respective systems.

Components and Functions Not Simulated

Backwashing of the raw water strainers (AC-12A and -12B) is not simulated.

Overflow and discharge from the bearing cooling water tank, potable water tank, and potable water relief valve is not simulated.

Circulating Water System Functional Description

Description of Simulated System

The primary function of the Circulating Water System (CWS) is to supply cooling water from the river to the main condensers. It also provides cooling water to the two bearing cooling water heat exchangers and to the condensate cooler. The system consists of an intake structure with grids and screens to filter out debris and ice from the river, three circulating water pumps, piping and valves to distribute the water, and instrumentation to allow the operator to monitor the operation of the system.

In order to reduce fouling, flow through each of the four simulated tube bundles can be reversed. The instructor can either individually manipulate the intake/discharge valves for each quarter, or use a single LOA which will automatically reposition all of the valves for the respective quarter.

In order to prevent icing of the grids/screens during cold weather operation, the instructor can divert the warmed discharge water from the downstream side of the intake structure to the upstream side, where it mixes with the river water prior to entering the intake structure. This is accomplished with a single three-way valve, representing the sluice gate and stop logs actually used at the plant. Note that the flow path to the upstream discharge cannot handle as much flow (has a lower admittance) than the downstream path.

Both the Fire Protection System and the Raw Water System draw their supply of water from the circulating water pump cells.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The thermodynamic simulation of the main condensers is performed by the Condensate and Feedwater (CFW) model.

The thermodynamic simulation of the bearing water heat exchangers and the condensate cooler is performed by the heat exchanger handler.

The logic for the operation of the traveling screens is performed by the traveling screen handler.

Components and Functions Not Simulated

The pump cell inlet and interconnecting sluice gates are not simulated.

The intake structure sump pit and sump pumps are not simulated; all leakage into the intake structure is lost from inventory.

Operation of the traveling screens is not simulated; the control logic is simulated only to the extent necessary to drive the status lights on CB-10.

The circulating water vacuum priming system is not simulated.

The screen wash system is not simulated.

The circ water pump cooling blower is not simulated.

Bearing seal water is not simulated.

Compressed Air System Functional Description

Description of Simulated System

The Compressed Air System (CAS) provides filtered and dried compressed air to the instrument air header for pneumatic controls and the actuation of valves, dampers, and similar devices. It also supplies air to the service air header for maintenance tools and large valves.

Air is supplied by three identical two-stage compressors that operate automatically to maintain air pressure. The compressors are connected to a discharge manifold that feeds the instrument and service air systems. Since most of the loads on the system are of an occasional nature, the system normally operates at a very low load factor. To prevent unnecessary wear on the compressors while still maintaining the ability to meet peak demands, local control switches are provided (accessible to the instructor via LOAs).

Under normal conditions, one compressor will be in continuous run mode. Its output will vary stepwise between 0 percent, 50 percent, and 100 percent of capacity, based on the positions of its two loading valves, which open and close in response to receiver pressure.

A second compressor will be in standby mode, available to automatically start if the running compressor cannot keep up with demand.

The compressed air flows first to two air receivers, one associated with the instrument air header, the other with the service air header. If pressure in the instrument air header reaches a low setpoint, an isolation valve in the service air line will close, shutting off air to the service air system. The third compressor is an offline spare.

Downstream of the instrument air receiver is an air drier. In the event that the drier becomes plugged, a bypass valve will open on a high differential pressure signal.

The air is then distributed through a network of loops, manifolds, and risers to the individual components. Many of the safety-related components h . their own accumulator, isolable from their respective riser by a check valve. This allows some operation of the valve following a loss of air to the riser.

Components and Functions Simulated Elsewhere

Control logic for the components that are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Usage of air by individual valves is simulated in the Valve Handler. Each time a valve is stroked, the handler decrements the pressure of the assigned supply by a specified amount. The supply pressure is then replenished by this model during its next iteration.

Components and Functions Not Simulated

The air drier, CA-4, is not dynamically simulated.

Turbine Lubricating Oil System Functional Description

Description of Simulated System

The Turbine Lube Oil System (TLO) provides a clean oil supply at suitable temperatures and pressures to the turbine generator unit bearings for both lubrication and cooling, to the high pressure bearing lift system, and to the wet pocket area of the front standard for the low speed timing cylinders. It also provides a makeup supply to the shaft seal oil system.

The simulated system includes; the reservoir (LO-1), the motor suction pump (LO-8) for startup, the shaft oil pump (LO-15), the oil-turbine-driven suction booster pump (LO-16), the turning gear oil pump (LO-3), the emergency bearing pump (LO-4), one lube oil cooler (LO-17), three high-pressure lift pumps (LO-14A, -14B, and -14C, representing the six actual pumps driven by three motors), and an oil supply line from an infinite supply.

Note: since all of the piping being simulated is double-walled piping, any leakage resulting from pipe break malfunctions is returned to the reservoir; the only loss of inventory results from leaks from the reservoir itself.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The turbine hydraulic control oil system is simulated in the Turbine Electrohydraulic Control model (EHC).

Turbine bearing instrumentation is modeled in the Turbine Supervisory Instrumentation model (TSI).

The generator shaft seal oil system is modeled in the Turbine Generator Auxiliaries model (TGA).

Components and Functions Not Simulated

The oil conditioning unit is not simulated, and only one of the redundant lube oil coolers is simulated.

The vapor extractor is simulated only to the degree that the associated lights on the control board will respond to manipulation of the control switch.

Heating Ventilation And Air Conditioning System Functional Description

Description of Simulated System

The Heating, Ventilation, and Air Conditioning System (HVA), as defined for the Fort Calhoun simulator, consists of the Auxiliary Building controlled and uncontrolled areas ventilation, control room ventilation, and diesel room ventilation.

The system performs the following functions:

Maintains the Auxiliary building at a comfortable temperature and provides adequate air changes for personnel comfort.

Provides control of radioactivity by ventilating areas where radiation may be released in accordance with the following guidelines:

Ensures that air flow inside the building is from areas of lower activity to areas of higher activity, thus avoiding the spread of activity.

Provides sufficient air flow to insure that legal radioactivity limits are met at points where ventilating air leaves the building.

Provides charcoal filtration of effluent air from the safety injection pump rooms, spent regenerant tank room, and spent fuel area to entrap iodine.

Provides for remote isolation of rooms where larger releases of radioactivity may occur.

Removes heat from various rooms to keep electrical equipment at acceptable temperatures.

Prevents hydrogen accumulation in the battery rooms.

Provides for venting the spent regenerant tanks, monitor tanks, and spent fuel pool demineralizer.

Provides a channel for release of gaseous wastes from the Waste Disposal System.

Prevents the accumulation of toxic vapors in rooms where chemicals are handled; e.g., the sampling room.

Provides a means for heating and cooling in the control room during normal operations.

Provides a means of ventilating the diesel rooms.

The HVAC System consists of supply fans, exhaust fans, dampers with remote indications and controls, and toxic gas monitoring instrumentation. The system is of the once-through non-recirculating type, with the exception of the control room ventilation system, which is recirculatory.

Components and Functions Simulated Elsewhere

Control logic for the components that are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrumentation Handler based on data received from this model.

Activity transport is performed by the Radiation Monitoring System model based on flow rates computed by this model.

Components and Functions Not Simulated

Service building ventilation is not modeled.

Office building ventilation is not modeled.

Intake structure ventilation is not modeled.

The Technical Support Center ventilation system is not modeled.

The HEPA and charcoal filters and the A/C units in the control room ventilation system are not modeled.

The fresh air inlet fan (VA-63) is not modeled.

The toilet exhaust fan (VA-49) is not modeled.

Fresh air dampers PCV-860A and PCV-860B are not modeled.

Main Generator System Functional Description

Description of Simulated System

The Main Generator (GEN) model simulates the main generator and associated protective relaying, including volts per hertz, underfrequency, loss of field, overexcitation, and distance relaying.

The Main Generator is a General Electric ATB 4 pole, 60 Hz unit, rated for 590.8 MVA at 22 KV and an 0.85 pf. The generator is directly coupled to and driven by the Main Turbine (modeled in TUR). The generator's output is directed to the low voltage side of the main output transformer, T1, where it is stepped up and fed to the power grid via substation No. 3451.

Excitation for the generator is provided by the output of an AC alternator-exciter coupled to the end of the main generator. The AC output is rectified by stationary silicon-diode rectifiers (SCRs) and the resulting DC output is fed to the main generator field.

The SCRs are controlled by the output of either the manual or automatic voltage regulating system. The manual system functions to maintain the main generator's field voltage at a setpoint generated by the 70P control switch mounted on CB-20. The automatic voltage regulation system maintains the main generator terminal voltage at the setpoint generated by the 90P control, also located on CB-20.

The Power System Stabilizer (PSS) functions to modify the voltage regulator's output to dampen power line swings, and to shift load in response to a signal generated by voltage and frequency.

The main generator's output is connected, through motor-operated disconnect switch DS- T1, to the 22 KV system, which is modeled in the Switchyard System (SWD).

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The following components/functions are performed in the Turbine Generator Auxiliaries model (TGA):

Hydrogen Cooling
Stator Cooling
Seal Oil System
Exciter Air Cooling

Synchronization and synch checking are performed in the Synchronizer model (SYN).

Components and Functions Not Simulated

The Power System Stabilizer is not explicitly simulated.

Emergency Diesel Generators System Functional Description

Description of Simulated System

There are two emergency diesel engine driven generators of identical design and characteristics. Each unit is complete with all auxiliaries necessary for operation and for ensuring quick starts. No auxiliaries are shared and no energy source external to the units, other than DC control power, is required for starting or subsequent operation.

The emergency diesel [illegible] are designed to furnish reliable inplant AC power a[illegible] safe plant shutdown and operation of engineered safeguards when outside power is not available. On a loss of a major bus (1A11, 1A13, 1A31, 1A33, 1A22, 1A24, 1A42, 1A44), any plant trip, or receipt of any PPLS or CPHS, the diesel generators will automatically start.

The diesels will start and energize their respective buses automatically with a loss of voltage on buses 1A3 and/or 1A4.

The diesels are started with stored compressed air. Each unit is provided with a duplicate air start system having the capacity for five starts. The air starting valve mechanism is simplified to a single solenoid valve associated with each air receiver. An LOA is provided for local operation. In case of a loss of DC control power, diesel generator DG-2 may be started and placed on-line locally at panel AI-133B.

The fuel storage capacity is sufficient for a minimum of one hundred hours of operation when both diesels are fully loaded, or to provide operation of one diesel in excess of one week.

Panel sections D1 on AI-30A and D2 on AI-30B in the control room are associated with the emergency diesel generators #1 and #2, respectively. These sections provide facilities for the automatic start, manual start, supervision of the availability and operating status of the engine and generator, auxiliary systems, and to provide a means of testing the units.

Generator voltage, current, frequency, and power are provided on CB-20 as well as breaker control. Additional alarms are displayed on A17 and A18.

The fuel auxiliaries are duplicated for each unit, including the fue oil systems between the day tank and the engine fuel line and fuel transfer pumps.

The lube oil system has a pressure pump for each diesel generator that circulates oil through a lube oil cooler cooled by a closed jacket water cooling loop. An oil circulating pump provides additional flow.

The cooling system is of the completely integral type, requiring no external power source, except the diesel itself.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The diesel generator room fans and dampers associated with the jacket water cooling radiators (JW-3-1 and JW-3-2) are modeled in the HVAC System (HVA).

Components and Functions Not Simulated

The local control panel for diesel generator #1, AI-133A, is not simulated.

Only one air receiver per train of the starting air system is modeled.

Inplant Electrical Distribution System Functional Description

Description of Simulated System

The Inplant Electrical Distribution System (EDS) is that portion of the Inplant Electrical Distribution System bounded by the secondary sides of transformers T1A-1, 2, 3, and 4 and includes the following buses, transformers and associated breakers:

4160 VAC Buses 1A1, 1A2, 1A3 and 1A4

4160/480 VAC Transformers T1B-3A, T1B-3B, T1B-3C, T1B-3D, T1B-4A, T1B- 4B, T1B-4C, T1C-3A, and T1C-4A

13.8 KV/480 VAC Transformer T1B-3C1

480 VAC Buses 1B3A, 1B3B, 1B3C, 1B3A-4A, 1B3B-4B, 1B3C-4C, 1B4A, 1B4B, and 1B4C

MCCs 3A1, 3A2, 3A3, 3A4, 4A1, 4A2, 3B1, 3B2, 3B3, 4B1, 4B2, 4B3, 3C1, 3C2, 3C4C-1, 3C4C-2, 4C1, 4C2, 4C3, and 4C4

Batteries 1 and 2

Battery Chargers 1, 2, and 3

125 VDC Buses 1 and 2

125 VDC Panels AI-41A and AI-41B

Static Inverters A, B, C, D, 1 and 2

Instrument Buses A (AI-40A), B (AI-40B), C (AI-40C), D (AI-40D), 1 (AI-42A) and 2 (AI-42B)

The 4.16 KV distribution system consists of four separate buses. Buses 1A1 and 1A2, unit auxiliary buses, feed only large major auxiliary loads at 4.16 KV. House service buses, 1A3 and 1A4, feed the remainder of the major 4.16 KV components and all other plant loads through 4160/480 V transformers, including all the engineered safeguard components.

In case of a complete loss of station supply power from both the 22 KV and the 161 KV systems, buses 1A3 and 1A4 are supplied automatically by two onsite emergency diesel generators, one on each bus. Buses 1A1 and 1A2 cannot be supplied from the diesels.

In the event that only one of the station supplies is lost, then the breakers associated with the transformer outputs would rapidly transfer the affected buses to the other station supply source (this transfer is subject to other interlock and safety considerations being met). Either of the supply systems is capable of supporting normal power plant operations and any emergency power needs.

With the exception of very large motor loads, nearly all of the rotating equipment, system power supplies, and most of the engineered safeguard features are fed from the 480 V distribution system. The system is comprised of three double-ended load centers, each load center having three sections or buses, for a total of ni- 480 VAC buses. Six of these buses are fed from the main 4160 V buses through transformers.

The third or island bus section of the load center can be fed from either of its main buses. Normally one end or the other of the load center is designated a "preferred" side for the purpose of balancing loads, especially those of a safeguard nature, between the separate power sources. The transformers are capable of supplying the power demands of both the main and the island buses in case of a failure of, or a power loss to, the other transformer.

Motor Control Centers (MCCs) distribute the power throughout the plant. In addition, various other motors are fed directly from the buses. Most of the main system breakers, MCCs and other motors can be remotely operated, energized or otherwise controlled from one or more of several panels in the control room.

In the event of a complete loss of power at the source of the 480 V buses, equipment is protected from damage automatically by undervoltage devices that will remove them from the bus. In the event a safety injection accident signal is received, automatic load shedding of selected loads and the starting of engineered safeguards is initiated.

In addition to the above mentioned equipment, three of the 480 V buses provide power to one 125 VDC battery charger for the DC distribution system. The DC distribution system is intended to provide a non-interruptible source of power for plant control and instrumentation. It is further intended that it will provide this source of power for a minimum of eight hours without any power source. The system is comprised of two separate buses, powered by an AC-DC battery charger in parallel with a wet cell storage battery. A third battery charger that can be aligned to either bus acts as an installed spare.

The two buses cannot be connected together. The battery chargers normally maintain the system load while maintaining a slight trickle charge on the battery. Large load increases are absorbed by the battery until the load is again within the capacity of the battery charger.

There are a total of six instrument buses. All of these buses (A, B, C, D, 1, and 2 are fed from the 125 VDC system via their own 120 VAC inverters. Buses A and C, and B and D, can be tied together with an alarmed tie breaker which is used only when a bus power supply is down for maintenance. The four primary buses, A through D, are normally operated independently as they make up one of the trip paths to the reactor protection logic circuits.

The individual loads on each bus are modeled within the applicable system model.

Instructor Overrides (LOAs) are provided for breakers for all equipment operated from the control panels, as well as for some important loads that are not. LOAs are provided for operation of transfer switches for station lighting, breaker control power, diesel generator auxiliaries, rod control cabinet 480 V supply, and the inverter static switches.

Some buses are modeled with loads computed, but without the individual loads being explicitly modeled. An example of this would be an instrument bus.

Overcurrent trips are computed by the Breaker Overcurrent Routine, and the output from this routine is sent to the various 86 relays for breaker trips.

Malfunctions for bus faults are provided for all major buses.

Components and Functions Simulated Elsewhere

[illegible] and 345 KV components are modeled within the Switchyard (SWD) model.

Main generator output and 22 KV components are modeled within the Generator (GEN) model.

Synchronizing equipment and switches are modeled within the Synchronizer (SYN) model.

13.8 KV components are modeled within the Switchyard (SWD) model.

Components and Functions Not Simulated

Motor Control Centers 4A3 and 3C3 are not modeled.

The computer inverters are not modeled.

Ground protection relays are not modeled.

Loads that are nonessential (such as hoisting equipment) are not modeled.

Switchyard System Functional Description

Description of Simulated System

The Switchyard System (SWD) basically models the grid system and its interfaces with the plant electrical system. The Switchyard System consists of the two main auxiliary transformers (T1A-1 and -2) and the two main house service transformers (T1A-3 and - 4); their associated disconnect switches (DS-T1A-1, -2, -3, and -4); the 161 KV bus and 345 KV busses; the associated grid breakers (3451-2, -4, -5, -6, and 111); the grid disconnect switches (MOD-4E and -5W); and the 13.8 KV feed to the 480 V system. The main generator transformer T1 is also included in this system.

The plant's electrical output is supplied at 22 KV to the output transformer T1 where it is stepped up to 345 KV for transmission to the OPPD power distribution grid. In addition to the 22 KV supply to T1, a bus taps off between the generator disconnect switch and T1 to supply the unit auxiliary transformers (T1A-1 and T1A-2) through a set of manually operated disconnect switches (DS-T1A-1 and DS-T1A-2).

While the unit does not have an output breaker as such, the breakers 3451-4 and 3451-5 are part of a ring bus in the substation. Breakers 3451-2 and 3451-6 are also part of the ring bus and are normally operated locally. Three high voltage transmission lines connect the onsite switchyard to Omaha, Lincoln, and Sioux City. Each of the three 345 KV lines has sufficient capacity to carry the station's output.

The 161 KV grid supplies the house service transformers (T1A-3 and T1A-4) through breaker 111. Each of these transformers also has its own motor operated disconnect switch (DS-T1A-3 and DS-T1A-4).

The four 4160 V transformers that provide power for plant services are the unit auxiliary transformers T1A-1 and T1A-2 and the house service transformers T1A-3 and T1A-4. The transformers are, except for primary voltages, essentially identical. Either pair of transformers is capable of providing the needs of the plant during operation. The transformers are monitored and controlled from the control room. Once placed in service, the transformers are basically passive devices, and do not need any operator action to meet changing load conditions.

The unit auxiliary transformer disconnect switches are operated locally, and have indicating lights in the control room. There are no electrical interlocks associated with these switches.

However, the disconnects cannot be operated until their respective 4160 V breakers have been opened, racked down, and interlock keys removed and placed in the control boxes for the disconnect switches. The house service transformer disconnect switches, even though they are motor operated, are locally operated also. There are no electrical interlocks for these switches, either; they are prevented only by procedure from being opened under load.

During plant shutdown, the 22 KV bus is normally supplied from the 345 KV grid by feeding back through T1. While this is not, in the true sense, a source of emergency power, it does provide power when the turbine is not available. Due to operational and interlock considerations, it is not an immediately available source of power. If there is a problem with either the 345 KV or 22 KV system, the source may not be available at all.

The back feed is normally accomplished by opening the generator output disconnect switch DS-T1. As this switch is not designed to be a current interrupting device, the generator must be off-line and the 345 KV substation breakers must be open prior to opening the switch.

In the event that the plant suffers a total loss of AC power, the plant can be maintained in a standby condition by way of a 13.8 KV to 480 V transformer supplying 480 V bus 1B3C. This feeder is supplied from the 161 KV grid before the substation supply breaker to the plant. Its capacity is limited to approximately 300 amps at 480 VAC, and is only intended to provide the bare essentials to maintain the plant in a stable standby condition until the other power sources can be reestablished.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The main generator, together with disconnect DS-T1 and its associated interlocks, is modeled in the Main Generator model (GEN).

Inplant electrical distribution is modeled in the Electrical Distribution model (EDS).

Synchronizing is performed in the Synchronizer model (SYN).

The characteristics of each line of the grid, and overall grid frequency, can be set by the instructor via External Parameters.

Isolated phase bus duct cooling is modeled in the Turbine Generator Auxiliaries model (TGA).

Components and Functions Not Simulated

Disconnect switches MOD-4E and -5W are not explicitly simulated.

Grounding relays are not simulated.

Synchronizing System Functional Description

Description of Simulated System

The synchronizing system consists of all of the synch switches as well as the synchroscope, incoming voltmeter, incoming frequency meter, running voltmeter, and running frequency meter. It also includes the synchronizing relays for breakers 3451-4 and 3451-5, and breaker 111.

The synch switches serve to provide the logic necessary to determine which buses feed the incoming and running voltage and frequency circuits. These circuits drive the synchroscope with its fast and slow lights. Any breaker closure permissives that require synchronization are supplied from this system. They also serve to feed the incoming and running voltage and frequency meters.

The synchronizing system also serves to provide the fast transfer block signal on underfrequency or excessive phase angle. Within the limitations of a simulated synchronizing system, the determination of excessive phase angle is an output taken from the synchroscope itself, as the mathematical modeling does not take into account phase angle in a single phase model.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Generator underfrequency is modeled in the Generator model (GEN).

Components and Functions Not Simulated

Phase angle is not simulated.

Synchronizing relays are not accurately modeled. The determination of phase is derived from the synchroscope driver.

Diesel Sequencing System Functional Description

Description of Simulated System

The D-G Sequencing System (DSQ) consists of four panels, two associated with D1 and two associated with D2. One panel of each channel contains the AC timers, and the other the DC timers. The panels of each channel are functionally redundant to each other.

The D-G Sequencing System functions to sequentially load Safeguards loads onto the Safeguards Busses following the receipt of a Safeguards actuation signal or manually initiated test signals. The main components of each panel are the sequencer timers, keyed switches for enabling or disabling auto-start of the Safeguards components, and the status lights for each component. Each panel is equipped with devices and circuits for automatic or manual initiation, control, supervision, and testing of the sequencers.

Upon initiation, either from a Safeguards signal or a manual test signal, the 86 relay for the applicable sequencer will trip, sending a signal to each timer to start timing.

When each timer reaches its specified time setting, it in turn sends a signal to its associated component to start. If at any time during or after this process the voltage of Safeguard Bus 1A3 or 1A4 is lost, the associated sequencer timers will de-energize and reset. When power is restored, the timers will time-out, re-sequencing the loads on the bus.

With minor exceptions, the D-G Sequencing System has no function during normal operation, and will operate only in the event of an accident or when under test.

Cross connections between the channels are held to the unavoidable minimum, and such connections are buffered and arranged to prevent communication of faults.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Components and Functions Not Simulated

The DC sequencer timers (magastats) are not physically functional; their timing function is performed with software.

Bearing Cooling Water System Functional Description

Description of Simulated System

The Bearing Cooling Water (BCW) System is a closed loop, temperature controlled circulating water system utilizing two electrically driven centrifugal pumps to circulate clean, treated water to the following components:

Turbine bearing oil coolers
Feedwater pump lube oil coolers
Feedwater pump seal coolers
Condenser vacuum pump sealing water coolers
Air compressor inter and after coolers
Hydraulic oil coolers on the turbine power unit
Heater drain pump coolers
Condensate pump upper bearing oil coolers
Main generator alternator cooler
Isolated phase bus duct cooler

With the exception of the isolated phase bus duct cooler and the turbine bearing oil coolers, these components are simulated as lumped heat loads to the BCW System.

A three-way control valve regulates flow through or around the bearing water heat exchangers to maintain the outlet temperature at the desired setpoint.

A backup supply of cooling water (from the potable water system) is available to the air compressors, in the event of a failure of the BCW System.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Components and Functions Not Simulated

The following components are not simulated in the BCW system:

Secondary sampling center cooler
Air drier cooling unit
Chemical mixing tank
BCW water chemistry is not simulated

Turbine Generator Auxiliaries System Functional Description

Description of Simulated System

The Turbine Generator Auxiliaries (TGA), as defined for the Fort Calhoun Simulator, is divided into four subsystems. These are:

The generator gas control system
The shaft seal oil system
The stator cooling water system
The isolated phase bus duct cooling system.

In the main generator, hydrogen gas is used to transfer heat produced within the generator windings to four condensate-cooled hydrogen cooling coils mounted within the generator casing. The hydrogen gas is circulated by a single stage fan mounted on and driven by the generator rotor.

Hydrogen, despite its flammability/explosive hazard, is used due to its superior heat conduction capacity and low viscous drag. In order to safely permit maintenance to be performed on the machine, the hydrogen gas must first be exchanged with an inert gas (carbon dioxide), which is then exchanged with air. This prevents the formation of explosive hydrogen-oxygen mixtures within the generator casing. The procedure is reversed when preparing the generator for operation. The generator gas control system provides the means for establishing and maintaining the proper gas concentration in the generator as required by the plant condition, and for safely venting hydrogen outside of the turbine building.

The shaft seal oil system is used to seal the openings in the main generator casing where the shaft passes through in order to prevent the internal hydrogen gas from escaping (or oxygen from entering). In a manner analogous to the turbine shaft steam seal system, oil is pumped to the midpoint of each seal. Part of it flows outward along the shaft, preventing oxygen from entering, while part of it flows inward, preventing hydrogen from escaping.

Appropriately located drains collect the oil and return it to the system for reuse. The system includes the necessary pumps, reservoir, piping, and a vacuum tank (for removing dissolved gasses from the oil). A makeup/backup supply of oil is available from the Main Turbine Lubricating Oil System (TLO).

The stator cooling water system is a closed-loop cooling system consisting of two pumps, two main exchangers, various cooling coils, and interconnecting piping, which removes heat from the generator stator and the rectifier/exciter assembly and rejects it to the Condensate System (CFW). A regulator maintains the pressure of the cooling water to the generator at 3 psi below the pressure of the generator hydrogen gas.

The isolated phase bus duct cooling system provides cooling air to the bussing that physically connects the generator's output to the main output transformer.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The steam seal system is modeled in the Main Turbine System (TUR).

Components and Functions Not Simulated

Stator cooling water chemistry, including the demineralizers and filters, is not modeled.

The hydrogen and carbon dioxide gas bottles used to supply gas to the generator gas control system are not modeled.

The supply gasses are modeled as infinite supplies at pressures can be set by the instructor via LOAs.

The generator seal oil filters are not modeled.

Fire Protection System Functional Description

Description of Simulated System

The simulated Fire Protection System (FPS) consists of a motor-driven jockey pump for pressurizing the system; a motor-driven fire pump; a diesel-engine-driven fire pump; sprinkler systems serving the turbine building, the turbine building offices, and the AFW Pump Room; deluge valves serving the five main transformers, the diesel generator rooms, Room 19, the auxiliary building stairwell, the auxiliary building hatchway, and the TSC charcoal filter; and interconnecting piping and necessary instrumentation.

Interconnections from the fire main to raw water (to service the CCW heat exchangers), and to the AFW storage tank (for makeup) are also simulated.

Components and Functions Simulated Elsewhere

Control logic for the components that are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Components and Functions Not Simulated

Fire detection, monitoring, and indication are not modeled.

The halon fire suppression systems are not modeled.

Secondary effects of water suppression system actuation are not modeled.

The pneumatic portions of the dry-pipe deluge systems are not modeled.

Miscellaneous Yard hydrants, hose reels, and suppression systems not mentioned above are not modeled.

Reactor Regulating System Functional Description

Description of Simulated System

The simulated Reactor Regulating System implements portions of several discrete control systems utilized in the control and operation of the power plant. Each of these control systems is made up of both digital logic controls and analog process controls. In order to generate the proper outputs to effect the desired process control, the control networks receive process information from the associated models and control information from switches and controllers mounted on the control panels. The RRS model primarily performs preprocessing on the control signals, then passes its outputs to the respective handlers.

The systems simulated include:

Rod Control - RRS evaluates the status of power supplies, interlocks, and switch positions to determine a rod motion demand signal for each Control Element Assembly (CEA). It also drives the CEA status lights.

Tave Control - RRS computes both reference and actual Tave based on plant operating conditions.

Pressurizer Pressure Control - RRS computes the analog spray valve position and variable heater output signals, and sums the total heater output.

Low Temperature Overpressure Protection (LTOP) - RRS computes the setpoint temperatures and pressures based on current plant conditions.

Pressurizer Level Control - RRS computes the reference level signals, level deviation signals, and letdown flow control valve demand signals.

Steam Dump/Bypass Control - RRS performs all of the logical and analog computations necessary to correctly position the steam dump/bypass valves.

Steam Generator Level Control - RRS preprocesses the inputs to the feedwater flow control network; it density compensates the steam flow signal, generates the steam flow/feed flow mismatch signal, and normalizes the signal for use by the Controller Handler. It also implements the malfunctions of the logical control signals.

Reactor Makeup Control - RRS scales the flow deviation setpoint data for use by the bistable handler.

Components and Functions Simulated Elsewhere

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Signals to components affected by this model which implement engineered safeguards features are generated in the Engineered Safeguards Features model (ESF).

This model only computes CEA motion demand signals; actual rod movement and CEA positions are simulated in the Control Rod Drive model (CRD).

Reactor protection and trip signals are computed in the Reactor Protective System model (RPS).

Components and Functions Not Simulated

No signals for automatic rod control are computed, as the circuitry is disconnected at the plant. The in/balance/out lights are not dynamically driven; they can be set by the instructor using overrides.

Reactor Protection System Functional Description

Description of Simulated System

The Reactor Protection System (RPS) consists of the following:

Trip units
Coincidence logic matrices
Clutch power trip circuits
Power supplies
RPS testing system
Thermal Margin/Low Pressure Trip (TM/LP) calculator
Variable Over Power Trip (VOPT) calculator
Axial Power Distribution (APD) calculator
Asymmetric Steam Generator Transient (ASGT) calculator
Auxiliary logic
RPS Calibration and Indiction Panel (RPSCIP)
Diverse scram trip logic

The four trip unit bins, each consisting of twelve trip units, monitor the NSSS protective parameters and input to the coincidence logic matrix if a trip setpoint has been exceeded.

The six coincidence logic matrices perform two-out-of-four logic and send a signal to the clutch power supply trip circuits. The clutch power supply trip circuits interrupt AC power to the clutch power supplies when a protective signal exists. This will cause a reactor trip.

The power supplies provide power to all the systems listed above and to the RPS testing system.

The RPS testing system allows periodic testing of the complete Reactor Protective System with the reactor operating at power or shutdown.

The TM/LP Calculator provides for plant protection in the event of a loss of coolant accident, and also prevents operation when the DNBR is less than 1.18.

The VOPT Calculator (Variable Over Power Trip) provides an operator-adjustable high power level trip.

The APD Calculator provides a trip signal to ensure that excessive axial peaking caused by xenon oscillations or CEA movement will not cause fuel damage.

The ASGT Calculator provides a trip signal on an excessive difference between steam generator pressures to protect against the loss of heat removal capability from the primary system.

The four Auxiliary Logic Assemblies house auxiliary relays to provide for automatic bypass and automatic bypass removal, and also house the two-out-of-four logic networks to provide control signals for the pressurizer power-operated relief valve.

The four Reactor Protective System Calibration and Indication Panels provide a means of calibrating the trip and pre-trip setpoints of the bistable trip units, output of the high power bistable trip units, Delta T Power reference signal, and the Delta T cold signal. The RPSCIPs also provide an accurate readout of selected signal parameters in the RPS.

The Diverse Scram Trip Logic provides for reactor shutdown in the event that two out of four pressurizer pressure bistables trip on high pressure to prevent harmful thermal and hydraulic pressures from damaging the primary system.

All of the logic of the RPS will be fully simulated. Full simulation of all front panel instrumentation and controls will be provided utilizing standard simulator I/O hardware. This will include the responses to adjustments of the front panel controls during testing or calibration. The test system will be simulated by incorporating additional test switch contacts wired to the trip test cable jacks.

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards, is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The decimal points on the RPSCIP DVMs are controlled by the meter input selector switch, not by software.

Components and Functions Not Simulated

The internals of the Reactor Protection System cabinets are not simulated.

Engineered Safeguards System Functional Description

Description of Simulated System

The Engineered Safeguards System functions to actuate Safeguards and essential support systems automatically. Means for manual operation are also provided. The system includes control devices and circuits for automatic or manual initiation, control, supervision, and manual test of the Engineered Safeguards components described in the appropriate section of other DBDs.

With minor exceptions, the safeguards control system has no function during normal operations and ill operate only in the event of an accident during or after plant shutdown, or when under test.

The control system consists of two independent, functionally redundant systems called the "A" and "B" Train. Cross connections between the systems are held to the unavoidable minimum, and such connections are buffered and arranged to prevent communication of faults. In each system, the logic basis for initiation signals is two-out-of-four, with the exception of Containment Radiation high, which is one-out-of-five. Each train has both a "primary" and a "derived" signal, the latter being supplied from the redundant train through a Derived Signal Cut-off Switch.

A brief description of the individual ESF signals follows:

The Containment Pressure High Signal (CPHS) is sensed by eight pressure switches that measure containment pressure. The signals are split, four switches for each train.

The Pressurizer Pressure Low Signal (PPLS) is sensed by four channels measuring pressurizer pressure. The signal is doubled by relays to give the necessary two-out-of-four logic to each train.

The Containment Radiation High Signal (CRHS) is sensed by five radiation monitors, two measuring containment activity, and three measuring stack activity. This signal is split by relays to provide a one-out-of-five logic to each train.

The Storage Tank Low Signal (STLS) is sensed by eight level channels that measure the Safety Injection and Refueling Water Storage Tank (SIRWT) level.

The Steam Generator Low Signal (SGLS) is sensed by eight pressure channels, four for "A" steam generator and four for "B" steam generator.

The Steam Generator Isolation Signal (SGIS) is initiated by either the SGLS or the CPHS.

The Containment Isolation Actuation Signal (CIAS) is initiated by either the CPHS or the PPLS.

The Safety Injection Actuation Signal (SIAS) is initiated by either the CPHS or the PPLS.

The Containment Spray Actuation System (CSAS) is actuated by signals from PPLS and CPHS in combination.

The Ventilation Isolation Actuation Signal (VIAS) is actuated by either CRHS, CSAS, or SIAS.

The Recirculation Actuation Signal (RAS) is actuated by STLS in combination with either PPLS or CPHS.

The Auxiliary Feedwater Actuation Signal (AFAS) is actuated by low steam generator water level with permissives determined from steam generator differential pressures.

The Offsite Power Low Signal (OPLS) is generated by the measurement of low voltages in combination with an SIAS. The 4160 VAC distribution system is isolated from the grid on receipt of this signal.

The 480 VAC Load Shed signal is generated by the SIAS and serves to strip nonessential loads from the 480 VAC distribution system.

Components and Functions Simulated Elsewhere

The individual components which receive ESF signals are modeled in their respective system.

Control logic for the components affected by signals generated by this model is implemented in the component's respective handler.

The diesel generators are modeled in the Diesel Generator model (DSG).

The safeguards sequencers are modeled in the Diesel Sequencers model (DSQ).

Components and Functions Not Simulated

Test switches, jumpers, and plugs utilized in panels not simulated are not modeled. These include, but are not limited to, AI-196, AI-197, AI-198, and AI-199.

Auto Load Shed Test Switch functions are not modeled.

The override test switches for the OPLS lockout relays are not modeled.

Nuclear Instrumentation System Functional Description

Description of Simulated System

The Nuclear Instrumentation System (NIS), utilizes ten excore detectors which measure flux leakage outside of the reactor vessel. These detectors are designated the Wide-Range Logarithmic Channels, Linear Power-Range Safety Channels, and the Linear Power-Range Control Channels

Wide-Range Logarithmic Channels

Each of the four wide-range logarithmic channels performs the following functions:

Provides flux level indication

Supplies a Start-Up Rate (SUR) signal to the Reactor Protective System (RPS) for the high-SUR reactor trip

Generates protective interlocks to automatically unblock (and block) reactor protective functions

Provides a signal that can be selected as the input to a common audio count- rate circuit

The wide-range detector consists of two fission chambers: wide-range (shielded, measuring 10 decades of neutron flux), and extended-range (unshielded, extending the range downward an additional two decades).

In the extended range, the signals from both chambers are gamma-discriminated and summed. Above the extended range, only the undiscriminated signal from the wide-range chamber is used. The transition into and out of the extended range produces a discontinuity in the indication. The same wide-range (or extended-range) detector signal is processed independently by two parallel circuits: log count-rate (covering the lower 7 decades); and log Campbell (covering the upper 5).

The count-rate circuit's output is proportional to the logarithm of 1/2 of the discriminated pulse count-rate. The Campbell circuit's output is proportional to the logarithm of the rms value of the detector signal. Above a certain power level, the count-rate signal is clamped at a preset maximum value. Below that same power level, the Campbell signal is biased off. The all- electronic transition between counting and campbelling is smooth and continuous.

The count-rate and Campbell signals are summed to produce the wide-range channel signal, which is applied to a rate amplifier (SUR) and various indications, bistables, and alarms.

An audible count rate is developed by taking a signal from the count-rate circuit and processing it through an audio rate scaler and amplifier.

Indications and alarms are provided at the alternate shutdown panel by feeding two signals from the wide-range channel D detector to a dedicated signal processor. The extended-range (unshielded) chamber signal is processed by a log power-range circuit, which is equivalent to the count-rate and Campbell circuits of the channel drawer. The summed output of both fission chambers is processed by a source-range circuit, which is equivalent to just the count-rate circuit of the channel drawer. The source-range and log power-range signals are processed independently and displayed separately.

Linear Power-Range Safety Channels

Each of the four linear power-range safety channels performs the following functions:

Provides indication

Supplies linear channel and subchannel power signals to the RPS for various reactor protective functions

Generates protective interlocks to automatically unblock (and block) reactor protective functions

The linear power-range detectors are dual-section uncompensated ion chambers. Each detector consists of two long chambers, upper and lower. Each chamber's signal is processed independently by its own associated subchannel: A, lower chamber or B, upper chamber. Deviation (upper minus lower) between the two subchannel signals is measured and forwarded to RPS. Each subchannel separately performs the following functions: amplification, indication, and comparison (individual subchannel compared to average subchannel).

The individual subchannel signals are summed and averaged to produce the channel signal [(U+L)/2]. The channel signal is applied to a negative-rate circuit (for dropped rod protection), a comparator averager (to obtain the average subchannel signal), and to various indications, bistables, and alarms.

Linear Power-Range Control Channels

The only function of the two linear power-range control channels is to provide indication.

The detectors and electronics drawers of the power-range control channels are identical to those of the power-range safety channels.

The NIS system also provides inputs to the Emergency Response Facility Computer System (ERFCS).

Components and Functions Simulated Elsewhere

Control logic for the components which are operable from the control boards is implemented in the various handlers.

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

The actual neutron flux signals are computed by the Reactor Core model (RXC).

Components and Functions Not Simulated

The remote count-rate speaker (located in containment) and its associated volume control adjustment (located on AI-31E/CN1) are not simulated. NM-004, the optical isolator for WR log channel D signals to the alternate shutdown panel, is not simulated.

The A+B/2 switch located inside the linear power-range drawer (normally left in the A+B/ 2 position) is not simulated.

The X1/X10 range (sensitivity) switch located inside the power-range drawer (hardwired in the X1 position) is not simulated.

The remote indicators for the power-range control channels (RI-003 and RI-004) and the associated X1/X10 scale indicating lights located at AI-4A and AI-4B are not simulated.

Incore Instrumentation System Functional Description

Description of Simulated System

The Incore Instrumentation System is used to provide indication of core flux, which is used to analyze and verify the core flux limits. It is also used to monitor the temperature of the reactor coolant exiting the core. The Incore Detector System consists of 28 instrumented incore assemblies installed within the reactor core which provide inputs to the ERF computer and the QSPDS.

The incore instruments are used to:

Verify that the radial peaking factors (F_{XY}^T and F_R^T) are less than the limits specified in the Technical Specifications.

Provide flux related signals which are compared to alarm levels set into the plant computer (which generates alarms if the power density (kW/ft) margins are exceeded in the core) and used as inputs to an offsite computer which calculates the power density (kW/ft).

Determine the axial shape index for periodic verification of the calibration of the Excore Detector System.

Determine the steady-state axial and radial neutron flux distribution in the core, in addition to a determination of flux tilts.

Provide data on which to estimate fuel burnup.

Provide average core temperature indication for no flow conditions, or local core temperatures.

All of the incore assemblies contain a string of four rhodium detectors and a thermocouple. Axially, the four rhodium detectors in each incore assembly are positioned such that their centerlines coincide with 20, 40, 60, and 80 percent of core height when the assembly is inserted into the core, i.e., detector 1 in each string is the bottom detector at the 20 percent height, detector 2 is at the 40 percent height, etc. The individual detectors are 40 cm in length, and the entire string terminates with a core exit thermocouple at the top of the core. Radially, the 28 incore detector assemblies are located assymmetrically. The detector assemblies are located such that, at full power operation, sufficient data is obtained to give an understanding of how the neutron flux in the core is distributed.

This detector arrangement has been selected such that, in view of the 1/8 core symmetry, every type of fuel assembly not occupied by a CEA (Control Element Assembly) is instrumented at least once. In addition, no incore detector assemblies have been placed in peripheral fuel assemblies near the coolant nozzles.

The incore detector signals feed the ERF computer and are monitored and alarmed in the control room on the alarm printer. The core exit thermocouples feed the QSPDS, and are then transferred to the ERF computer for display in the control room.

The data from both the thermocouples and the incore detectors can be printed out periodically or on demand.

The incore instrumentation model computes the X-Y flux profiles in the core, based on the Z-axis flux distribution computed by the Reactor Core model (RXC).

Components and Functions Simulated Elsewhere

Signals representing process information transmitted via instrument loops are generated by the Instrument Channel Handler based on data received from this model.

Analyses of the incore detector data are not performed in this model, but by the ERFCS computer system.

Analyses of the core exit thermocouple data are performed by the QSPDS.

The Heated Junction Thermocouple outputs are computed in the RCS model.

Components and Functions Not Simulated

There are no background or vanadium detector flux signals simulated.

Radiation Monitoring System Functional Description

Description of Simulated System

The Radiation Monitoring System (RMS), as defined for the Fort Calhoun simulator, performs the following functions:

Computes activity levels throughout the plant

Simulates the various activity sensors

Displays information on the RMS panels

Processes inputs received from the RMS panels

The activity levels are computed based on known source levels (e.g., fuel element failure) and transport times. The transport times are derived from the fluid system flow rates computed by the individual models. Reduction of activity due to species decay over time is also accounted for, as is removal by filtration or discharge to the external environment.

The system consists of 19 process monitor channels, 22 area monitor channels, and associated detectors, filters, and sampling pumps. These can be broken up into three general categories based on the functionality of the display unit, as described below.

942A UNIVERSAL DIGITAL RATEMETER

The Victoreen model 942A UDR is a microprocessor-based display unit used for all of the process monitors (RM-050 through RM-064, non-consecutively). It performs as follows:

Power Up

When the UDR is powered up, the bar graph will display 10E7 for one second, and the digital display will read 0.00E0 CPM for seven seconds. Following the seven second period the display will indicate the current count rate and any alarm conditions.

Display Update

All of the front panel displays and indicators update or change state at one second intervals, with some exceptions that will be discussed later. For example, if the Warn Alarm light is blinking, it blinks at a one second frequency; or if the Alarm Ack push-button is depressed immediately following a display update, the Warn light will not stop blinking until the next one-second update.

The exception to this occurs when the count rate falls below the Target Counts selected for the desired accuracy level. Under these conditions the CPM value will only be updated at one minute intervals.

CPM Calculation

As mentioned in the immediately preceding section, the digital display is updated at one second intervals. However, the indicated count rate is not a CPM value calculated from a one second sample. The UDR maintains a history of the last sixty one-second count rates; it also maintains a history of the last twenty one-minute counts. When the CPM display is updated, the total counts from the previous fifty-nine one-second counts are summed with the most recent one-second count. This value is then displayed as the CPM value. The end result is that, if the process signal changes, it will take sixty seconds for the UDR to accurately display the new process value.

However, if the current sixty-second sum value is not greater than the selected Target Counts value, the UDR calculates the CPM value by adding the stored one-minute sums to the current value until the Target Counts value is exceeded. The CPM rate is then computed as this total divided by the number of one-minute values summed.

Warn Alarm

When the input exceeds the warning alarm setpoint value, the Warn light will start flashing (amber in color), and the bar graph color will change to amber. The Warn light will continue to flash and the bar graph will remain amber in color until the Alarm Ack push-button is depressed (even if the input drops below the setpoint). At that time, the Warn light will come on solid. Once the input signal decreases below the setpoint value, the Warn light will go off, and the bar graph color will return to green.

High Alarm

When the input exceeds the high alarm setpoint value, the High light will start flashing (red in color), and the bar graph color will change to red. The High light will continue to flash and the bar graph will remain red in color until the Alarm Ack push-button is depressed (even if the input drops below the setpoint). At that time, the High light will come on solid.

Once the input signal decreases below the setpoint value, the High light will go off, and the bar graph color will change to amber (or green).

Rate Alarm

When the input exceeds the rate alarm setpoint value, the Rate light will start flashing (red in color) and the bar graph color will change to red. The Rate light will continue to flash and the bar graph will remain red in color until the Alarm Ack push-button is depressed (even if the input drops below the setpoint). At that time, the Rate light will come on solid. Once the input signal decreases below the setpoint value, the Rate light will go off, and the bar graph color will change to amber (or green).

Range Alarm

If the input falls below 10 CPM the Range light will come on red in color and stay on until the count rate exceeds 10 CPM. If the input exceeds the over-range setpoint the Range light will come on red in color and the bar graph will go full scale. Note that the bar graph goes full scale even if the over-range setpoint is less than 10E7. The digital display will display EEEEE CPM. When the counts decrease to a value less than the over-range setpoint, the UDR will remain in the above state until the power is turned off and then back on.

Fail Alarm

If the UDR receives zero counts for five minutes, the Fail light will come on and stay on. If the input exceeds the High Count Rate Threshold, the display will show EEEEE CPM, the fail light will come on and stay on, the bar graph will go full scale, and the anti-jam fuse will blow, disabling the high voltage power supply. The UDR will remain in this state until the input decreases to below the setpoint, the UDR is turned off, and the anti-jam fuse is replaced (via an LOA). All alarm functions are inhibited while the UDR is in the fail state.

High Voltage Push-button

The value of the high voltage will be displayed on the digital display during the next display update after the button is depressed. Note that the bar graph is still active when the high voltage value is being displayed.

High Alarm Push-button

The setpoint of the high alarm will be displayed on the digital display during the next display update after the button is depressed.

Warn Alarm Push-button

The setpoint of the warning alarm will be displayed on the digital display during the next display update after the button is depressed.

High Rate Push-button

The setpoint of the high rate alarm will be displayed on the digital display during the next display update after the button is depressed.

Check Source Push-button

The Check Source push-button must be held depressed for the check source to remain active. When the Check Source push-button is depressed and held depressed the following will occur; one second after the push-button is depressed the Check Source green light will come on; two seconds after depressing the push-button the display indicates 0.00E0 CPM, the Range light will come on, and the bar graph will go blank; three seconds after the push-button is depressed the display will show the check source value, the range light goes off, and the bar graph is active.

When the Check Source button is released, the following will occur: one second after the push-button is released the Check Source green light will go off; two seconds after releasing the push-button the display will indicate 0.00E0 CPM, the range light will come on, and the bar graph will go blank; three seconds after the push-button is released the display will show the process value, the range light goes off, and the bar graph is active.

Bar Graph Increments

The bar graph segments (three per decade), will be turned on in the following manner. When the current decade's indication reaches 2.5 the first segment will light. When the current decade's indication reaches 5.5 the second segment will light. The third segment lights when the current decade's indication reaches 8.5.

946A UNIVERSAL DIGITAL RATEMETER

The Victoreen model 946A UDR is a microprocessor-based display unit used for most of the area monitors (RM-070 through RM-089). It performs as follows:

Power Up

When the UDR is powered up, the bar graph will be blank, the Range light will be on (red), and the digital display will read 0.00E0 MR/HR for four seconds. Following the four second period the display will indicate 5.46 R/H and start to ramp to the current process value. It takes approximately two and a half minutes to reach the process value.

Display Scaling

The display will change format as the process signal moves from one decade to the next. As the format changes, specific digits are blanked out on the display. (Throughout this discussion, the letter "B" in a display example indicates that the digit is blanked.) The display format for each decade is as follows:

0.1 - .999 mR/hr	BB.NNN	MR/HR
1.0 - 9.99 mR/hr	BN.NNB	MR/HR
10.0 - 99.9 mR/hr	NN.NBB	MR/HR
0.1 - .999 R/hr	BB.NNN	R/HR
1.0 - 9.99 R/hr	BN.NNB	R/HR
10.0 - 99.9 R/hr	NN.NBB	R/HR
0.1 - .999 KR/hr	BB.NNN	KR/HR
1.0 - 9.99 KR/hr	BN.NNB	KR/HR

Display Update

All of the front panel displays and indicators update or change state at one second intervals, with exceptions that are discussed later. For example, if the Warn alarm light is blinking, it blinks at a one second frequency, or if the Alarm Ack push-button is depressed immediately following a display update, the Warn light will not stop blinking.

Warn Alarm

When the input reaches the warning alarm setpoint, the Warn light will come on amber in color and the bar graph will change to amber. The Warn light will blink on and off in one second intervals until the Alarm Ack push-button is pushed.

After the Alarm Ack push-button is pushed, the Warn light will stop blinking but remain amber in color. Once the input falls below the warning alarm setpoint, the Warn light will turn off and the color of the bar graph will change to green. If the input falls below the setpoint without the operator pushing the Alarm Ack push-button, the bar graph will automatically change back to green, but the Warn light will continue to flash amber until the push-button is pushed. It will then go out.

High Alarm

When the input reaches the high alarm setpoint, the High light will come on red in color, and the bar graph will change to red. The High light will blink on and off in one second intervals until the Alarm Ack push-button is pushed. After the Alarm Ack push-button is pushed, the High light will stop blinking but remain red in color. Once the input falls below the high alarm setpoint, the High light will turn off and the bar graph will change to amber in color. If the input falls below the setpoint without the operator pushing the Alarm Ack push-button, the bar graph will automatically change back to amber, but the High light will continue to flash red until the push-button is pushed. It will then go out.

Range Alarm

If the input falls below 0.1 mR/hr, the Range light will come on red in color and stay on until the radiation level exceeds 0.1 mR/hr. While below 0.1 mR/hr, the display will indicate BB.000 MR/HR and the bar graph will be blank.

If the input exceeds 9.99 KR/hr, the Range light will come on red in color and stay on and the bar graph will go full scale. The digital display will display EEEEE MR/HR (no decimal point). When the activity decreases to a value less than 9.99 KR/hr, the UDR will automatically resume functioning in the normal mode.

Fail Alarm

The fail alarm will come on if the input is less than 0.1 mR/hr for five minutes. The Fail light will come on and stay on after the five minute period.

High Alarm Push-button

The setpoint of the high alarm will be displayed on the digital display during the next display update after the button is depressed. The format is N.NNEN (or N.NN-N) MR/HR.

Warn Alarm Push-button

The setpoint of the warning alarm will be displayed on the digital display during the next update after the button is depressed. The format is N.NNEN (or N.NN-N) MR/HR.

Check Source Push-button

The Check Source function will remain active once the push-button is depressed. It will automatically deactivate after ten minutes, or can be manually deactivated by depressing the Check Source push-button.

When the Check Source function is activated, the following will occur: one second after activation the Check Source green light will come on; three seconds after activation the display will increase by 5670 mR/hr. The bar graph also increases by the same value. When the Check Source function is deactivated, the green Check Source light will go out after one second. After four seconds, the indication returns to the current value.

Note that the Check Source Function will not activate if the process activity level exceeds 1 R/hr. Once this level is reached, it must decrease to less than 0.8 R/hr to re-enable the Check Source function.

Bar Graph Increments

The bar graph segments (three per decade) will be turned on in the following manner: when the current decade's indication reaches 2.5, the first segment will light; when the current decade's indication reaches 5.5, the second segment will light; and the third segment lights when the current decade's indication reaches 8.5.

Response Time

The detectors used with the 946A UDRs have an inherent time lag which is dependent on the activity level. The response times for a change in readings within the decade are as follows:

0.1 - 0.999	mR/hr	80 seconds
1.0 - 9.99	mR/hr	32 seconds
10.0 - 99.9	mR/hr	16 seconds
0.1 - 0.999	R/hr	4 seconds
1.0 - 9.99	R/hr	2 seconds
10.0 - 99.9	R/hr	.9 seconds
0.1 - 0.999	KR/hr	.2 seconds
1.0 - 9.99	KR/hr	.2 seconds

If the process activity step changes by a factor of 100, the response time is bypassed and the appropriate decade will be skipped.

876A-1 HIGH RANGE AREA MONITOR

Victoreen 876A-1 analog high range monitors are used for post-accident monitoring of containment (RM-091A and RM-091B).

Display Scaling

With the control selector switch in the "All" position, the unit provides direct readout of process activity over a range of seven decades (1 - 10E7 R/hr). Placing the control selector switch in any of the other five range positions presents the data on an expanded scale covering only the three decades corresponding to the selected switch position.

Module Test

Placing the control selector switch in the "Test" position and depressing the Test push-button will cause the monitor's output to go full scale and light the blue Test light.

ECS Test

Depressing the ECS Test push-button will cause the monitor to read 10E3 R/hr for one second, then go to zero. The output to the recorder will be disabled while the push-button is depressed.

Alert Alarm

When the process activity exceeds the alert alarm setpoint, the amber Alert light will come on steady. Depressing the Fail/Reset button once the level has decreased to below the setpoint will clear the alarm. Holding the Fail/Reset push-button in while the activity is above the alarm setpoint disables the module alarm output.

High Alarm

When the process activity exceeds the high alarm setpoint, the red High light will come on steady. Depressing the Fail/Reset button once the level has decreased to below the setpoint will clear the alarm. Depressing and holding the Fail/Reset push-button while the activity is above the alarm setpoint will disable the alarm output from the module.

Fail Alarm

If the unit detects an internal failure, the green Fail light will go out.

Components and Functions Simulated Elsewhere

Control logic for the components affected by signals generated by this model is implemented in the component's respective handler.

Transport paths and transport delay times are determined by the individual thermohydraulic models.

Valves and other components that receive signals from this model are modeled in their respective thermohydraulic fluid system model.

Components and Functions Not Simulated

Explicit determination of the concentration of all individual radionuclides is not performed.

Since the iodine activity in the reactor coolant is explicitly known, the failed fuel analyzers (RM-214 and RM-214A) are not explicitly modeled.

The historical data for the 946A UDRs is not retained with the snapshot. During initialization, the historical data registers are packed with the current data.

APPENDIX 2.C

SYSTEM DESIGN DATA SUMMARY

Document	Description	Source	GSE#
OPPD-120	Operating Manual Technical Lata Book, Volume 1	OPPD	
OSAR 86-18	Operations Safety Analysis Review	OPPD	
OSAR 86-19	Operations Safety Analysis Review	OPPD	
OSAR 86-19	Reactor Physics Safety Analysis Data, Cycle 11	OPPD	
OSAR 87-19	Operations Safety Analysis Review	OPPD	
OSAR 87-20	Operations Safety Analysis Review	OPPD	
OSAR 87-38	Operations Safety Analysis Review	OPPD	
QUIX CASE	QUIX Computer Code Output	OPPD	
SHB 23-26-5	Student Handbook - Reactor Coolant System	OPPD	
SHB 23-26-6	Student Handbook - Reactor Coolant System	OPPD	
TDB-I	Wide Range Logarithmic Channels	OPPD	
11405-E-31	Annunciator Schematics	OPPD	12266
161F561	Interconnection Diagram	OPPD	9476
C-23866-411-320	Rod Drop Test Panel Schematic	OPPD	1297
E-23866-413-075	Safety Injection and Containment Spray System	OPPD	1617
SHB 23-26-6	Student Handbook - Reactor Coolant System	OPPD	
11405-E-147	Rx Coolant Gas Vent System Schematic	OPPD	21140
11405-E-17	4.16 KV Switchgear Schematics	OPPD	12253
11405-E-31	Annunciator Schematics	OPPD	12266
11405-E-402	Post Accident Monitoring Panel AI-65A	OPPD	23655
11405-E-403	Post Accident Monitoring Panel AI-65B	OPPD	23658
11405-E-404	Post Accident Monitoring Panel AI-66A	OPPD	23592
11405-E-405	Post Accident Monitoring Panel AI-66B	OPPD	23591
11405-E-51	HCV Schematics, Limit Sw Contacts	OPPD	12285
11405-E-59	Sampling, N2, H2 & Air Systems S.C. & I.	OPPD	12293
11405-EM-139	Instrument and Control Equipment List	OPPD	809
11405-EM-198	Instrument and Control Equipment List	OPPD	15290
11405-M-12	Primary Plant Sampling System Flow Diagram	OPPD	10442
11405-M-264	Aux Eldg & Containment Instrument Air Diagram	OPPD	16292
11405-M-264	Aux Bldg & Containment Instrument Air Diagram	OPPD	16293
136B2331	Index/Rev Sheet for Inst. Loop Diagrams	OPPD	7111
136B2331	Index/Rev Sheet for Inst. Loop Diagrams	OPPD	23651
136B2432	Elementary Diagram - Switch Development	OPPD	5711
136B2432	Elementary Diagram - Switch Development	OPPD	5730
136B2432	Elementary Diagram - Switch Development	OPPD	5754

Document	Description	Source	GSE#
151F561	Electrical Control Valve & Pump Index	OPPD	9488
161F561	Interconnection Diagram	OPPD	9476
161F561	Interconnection Diagram	OPPD	9481
161F561	Interconnection Diagram	OPPD	9482
161F561	Interconnection Diagram	OPPD	9483
161F561	Interconnection Diagram	OPPD	9484
161F561	Interconnection Diagram	OPPD	9487
161F561	Interconnection Diagram	OPPD	9489
161F561	Interconnection Diagram	OPPD	9491
161F561	Interconnection Diagram	OPPD	9493
161F561	Interconnection Diagram	OPPD	9494
161F561	Interconnection Diagram	OPPD	9496
161F561	Interconnection Diagram	OPPD	9497
161F561	Interconnection Diagram	OPPD	9498
161F561	Interconnection Diagram	OPPD	9499
161F561	Interconnection Diagram	OPPD	9500
161F561	Interconnection Diagram	OPPD	9501
161F561	Interconnection Diagram	OPPD	9502
161F561	Interconnection Diagram	OPPD	9503
161F561	Interconnection Diagram	OPPD	9504
161F561	Interconnection Diagram	OPPD	9505
161F561	Interconnection Diagram	OPPD	9506
161F561	Interconnection Diagram	OPPD	9512
161F561	Interconnection Diagram	OPPD	9513
161F561	Interconnection Diagram	OPPD	9514
161F561	Interconnection Diagram	OPPD	9516
161F561	Interconnection Diagram	OPPD	9517
161F561	Interconnection Diagram	OPPD	9518
161F561	Interconnection Diagram	OPPD	9519
161F561	Interconnection Diagram	OPPD	21478
161F561	Interconnection Diagram	OPPD	37780
161F575	Elem. Diag. - Annunciator Schemes A1 &A2	OPPD	9730
A4ENGR	Annunciator A-4 Engraving List	Westinghouse	
B-23866-414-360	Schematic Diagram - Electro Pneumatic Throttle Valves	OPPD	1259
CD-009A	Loop Connection Diagram	OPPD	45610

Document	Description	Source	GSE#
CD-009B	Loop Connection Diagram	OPPD	43067
CD-011C	Loop Connection Diagram	OPPD	43068
CD-011D	Loop Connection Diagram	OPPD	43069
CP-101X	PRESSURIZER LEVEL	OPPD	
CP-101Y	PRESSURIZER LEVEL	OPPD	
CP-103X	PRESSURIZER PRESSURE CHANNEL 103X	OPPD	
CP-103Y	PRESSURIZER PRESSURE CHANNEL 103Y	OPPD	
CP-105/123	PRESSURIZER PRESSURE WIDE RANGE CHANNEL B	OPPD	
CP-106	PRESSURIZER LEVEL	OPPD	
CP-107	PRESSURIZER VAPOR PHASE TEMPERATURE	OPPD	
CP-108	PRESSURIZER WATER PHASE TEMPERATURE	OPPD	
CP-109	RCS SPRAY AND SURGE LINE TEMPERATURE	OPPD	
CP-111C	REACTOR COOLANT LOOP 1 COLD LEG TEMPERATURE	OPPD	
CP-111H	REACTOR COOLANT LOOP 1 HOT LEG TEMPERATURE	OPPD	
CP-113/115	PRESSURIZER PRESSURE WIDE RANGE CHANNEL C	OPPD	
CP-118	PRESSURIZER PRESSURE SHUTDOWN COOLING INTERLOCKS	OPPD	
CP-120A	PRESSURIZER PRESSURE INPUT TO THE DSS CHANNEL A	OPPD	
CP-120B	PRESSURIZER PRESSURE INPUT TO THE DSS CHANNEL B	OPPD	
CP-120C	PRESSURIZER PRESSURE INPUT TO THE DSS CHANNEL C	OPPD	
CP-120D	PRESSURIZER PRESSURE INPUT TO THE DSS CHANNEL D	OPPD	
CP-121C	REACTOR COOLANT LOOP 2 COLD LEG TEMPERATURE	OPPD	
CP-121H	REACTOR COOLANT LOOP 1 HOT LEG TEMPERATURE	OPPD	
CP-134	PRESSURIZER RELIEF AND SAFETY VALVE DISCHARGE TEMP	OPPD	
CP-135	PRESSURIZER RELIEF AND SAFETY VALVE DISCHARGE TEMP	OPPD	
CP-136	PRESSURIZER RELIEF AND SAFETY VALVE DISCHARGE TEMP	OPPD	
CP-136	RC-142 Tailpipe Temperature	OPPD	
CP-137	REACTOR COOLANT SPRAY AND SURGE LINE TEMPERATURE	OPPD	
CP-138	REACTOR COOLANT SPRAY AND SURGE LINE TEMPERATURE	OPPD	
CP-139	REACTOR VESSEL LEAKAGE PRESSURE SWITCH	OPPD	
CP-141/142	ACOUSTIC VALVE FLOW MONITOR	OPPD	
CP-182	REACTOR COOLANT GAS VENT PRESSURE	OPPD	
CP-197	REACTOR COOLANT SHUTDOWN LEVEL	OPPD	
CP-198	SPRAY VALVE SEAL LEAKAGE TEMPERATURE	OPPD	
CP-A/102	PRESSURIZER PRESSURE CHANNEL 102	OPPD	
CP-A/112C	REACTOR COOLANT LOOP 1 COLD LEG TEMPERATURE	OPPD	

Document	Description	Source	GSE#
CP-A/112H	REACTOR COOLANT LOOP 1 HOT LEG TEMPERATURE	OPPD	
CP-A/114W	REACTOR COOLANT FLOW RATE	OPPD	
CP-A/114X	REACTOR COOLANT FLOW RATE	OPPD	
CP-A/114Y	REACTOR COOLANT FLOW RATE	OPPD	
CP-A/114Z	REACTOR COOLANT FLOW RATE	OPPD	
CP-A/122C	REACTOR COOLANT LOOP 2 COLD LEG TEMPERATURE	OPPD	
CP-A/122H	REACTOR COOLANT LOOP 2 HOT LEG TEMPERATURE	OPPD	
CP-B-122C	STEAM GENERATOR B WIDE RANGE PRESSURE	OPPD	
CP-B/102	PRESSURIZER PRESSURE CHANNEL 102	OPPD	
CP-B/112C	REACTOR COOLANT LOOP 1 COLD LEG TEMPERATURE	OPPD	
CP-B/112H	REACTOR COOLANT LOOP 1 HOT LEG TEMPERATURE	OPPD	
CP-B/114W	REACTOR COOLANT FLOW RATE	OPPD	
CP-B/114X	REACTOR COOLANT FLOW RATE	OPPD	
CP-B/114Y	REACTOR COOLANT FLOW RATE	OPPD	
CP-B/114Z	REACTOR COOLANT FLOW RATE	OPPD	
CP-B/122C	REACTOR COOLANT LOOP 2 COLD LEG TEMPERATURE	OPPD	
CP-B/122H	REACTOR COOLANT LOOP 2 HOT LEG TEMPERATURE	OPPD	
CP-C/102	PRESSURIZER PRESSURE CHANNEL 102	OPPD	
CP-C/112C	REACTOR COOLANT LOOP 1 COLD LEG TEMPERATURE	OPPD	
CP-C/112H	REACTOR COOLANT LOOP 1 HOT LEG TEMPERATURE	OPPD	
CP-C/114W	REACTOR COOLANT FLOW RATE	OPPD	
CP-C/114X	REACTOR COOLANT FLOW RATE	OPPD	
CP-C/114Y	REACTOR COOLANT FLOW RATE	OPPD	
CP-C/114Z	REACTOR COOLANT FLOW RATE	OPPD	
CP-C/122C	REACTOR COOLANT LOOP 2 COLD LEG TEMPERATURE	OPPD	
CP-C/122H	REACTOR COOLANT LOOP 2 HOT LEG TEMPERATURE	OPPD	
CP-D/102	PRESSURIZER PRESSURE CHANNEL 102	OPPD	
CP-D/102X	TM/LP. SETPOINT SIGMA D/PIA-102X	OPPD	
CP-D/112C	REACTOR COOLANT LOOP 1 COLD LEG TEMPERATURE	OPPD	
CP-D/112H	REACTOR COOLANT LOOP 1 HOT LEG TEMPERATURE	OPPD	
CP-D/114W	REACTOR COOLANT FLOW RATE	OPPD	
CP-D/114X	REACTOR COOLANT FLOW RATE	OPPD	
CP-D/114Y	REACTOR COOLANT FLOW RATE	OPPD	
CP-D/114Z	REACTOR COOLANT FLOW RATE	OPPD	
CP-D/122C	REACTOR COOLANT LOOP 2 COLD LEG TEMPERATURE	OPPD	

Document	Description	Source	GSE#
CP-D/122H	REACTOR COOLANT LOOP 2 HOT LEG TEMPERATURE	OPPD	
D-23866-210-111	Reactor Coolant Pump P&ID	OPPD	10473
CP-A/112H	REACTOR COOLANT LOOP 1 HOT LEG TEMPERATURE	OPPD	
CD-23866-210-111	Reactor Coolant Pump P&ID	OPPD	45591
D-23866-210-111	Reactor Coolant Pump P&ID	OPPD	45592
D-23866-210-111	Reactor Coolant Pump P&ID	OPPD	45593
D-4078	Generator Condition Monitor Remote Panel Layout	OPPD	20663
D-4159	Schematic diagram solenoid operated valves	OPPD	37777
E-00000-422-224	QSPDS Wiring Diagram	OPPD	37521
E-232-471	QSPDS Wiring Diagram	OPPD	1450
E-232-542	QSPDS Wiring Diagram	OPPD	1483
E-23866-210-110	Reactor Coolant System	OPPD	10475
11405-E-17	4.16 KV Switchgear Schematics	OPPD	12253
11405-E-31	Annunciator Schematics	OPPD	12266
11405-E-32	Pzr Heater Wiring Diag	OPPD	12267
11405-EM-3101/3118	Instrument and Control Equipment List	OPPD	21625
11405-EM-3121/3138	Instrument and Control Equipment List	OPPD	21628
11405-EM-3141/3158	Instrument and Control Equipment List	OPPD	21633
11405-EM-3161/3178	Instrument and Control Equipment List	OPPD	21635
11405-EM-3181/3192	Instrument and Control Equipment List	OPPD	21638
136B2340	4.16KV Controls & Elementary Diagram	OPPD	5521
136B2431	Elementary Diagram - Pumps and Valves	OPPD	5586
161F561	Interconnection Diagram	OPPD	9476
161F561	Interconnection Diagram	OPPD	9477
161F561	Interconnection Diagram	OPPD	9508
161F561	Interconnection Diagram	OPPD	9509
161F561	Interconnection Diagram	OPPD	9510
161F561	Interconnection Diagram	OPPD	9511
161F561	Interconnection Diagram	OPPD	9524
161F561	Interconnection Diagram	OPPD	9525
161F561	Interconnection Diagram	OPPD	9526
161F561	Interconnection Diagram	OPPD	9527
161F561	Interconnection Diagram	OPPD	22152
CP-3101	RC-3A UPPER OIL RESERVOIR LEVEL CHANNEL 3101	OPPD	
CP-3102	RC-3A LOWER OIL RESERVOIR LEVEL CHANNEL 3102	OPPD	

Document	Description	Source	GSE#
CP-3103	RC-3A GUIDE BEARING TEMPERATURE	OPPD	
CP-3104	RC-3A STATOR WINDING TEMPERATURE	OPPD	
CP-3105	RC-3A DOWNWARD THRUST BEARING TEMPERATURE	OPPD	
CP-3106	RC-3A UPWARD THRUST BEARING TEMPERATURE	OPPD	
CP-3107-1	RC-3A UPPER GUIDE BEARING TEMPERATURE	OPPD	
CP-3109	RC-3A OIL LIFT PERMISSIVE PRESSURE	OPPD	
CP-3121	RC-3B UPPER OIL RESERVOIR LEVEL CHANNEL 3121	OPPD	
CP-3122	RC-3B LOWER OIL RESERVOIR LEVEL CHANNEL 3122	OPPD	
CP-3123	RC-3B GUIDE BEARING TEMPERATURE	OPPD	
CP-3124	RC-3B STATOR WINDING TEMPERATURE	OPPD	
CP-3125	RC-3B DOWNWARD THRUST BEARING TEMPERATURE	OPPD	
CP-3126	RC-3B UPWARD THRUST BEARING TEMPERATURE	OPPD	
CP-3127	RC-3B UPPER GUIDE BEARING TEMPERATURE	OPPD	
CP-3129	RC-3B OIL LIFT PERMISSIVE PRESSURE	OPPD	
CP-3141	RC-3C UPPER OIL RESERVOIR LEVEL CHANNEL 3141	OPPD	
CP-3142	RC-3C LOWER RESERVOIR LEVEL CHANNEL 3142	OPPD	
CP-3143	RC-3C GUIDE BEARING TEMPERATURE	OPPD	
CP-3144	RC-3C STATOR WINDING TEMPERATURE	OPPD	
CP-3145	RC-3C DOWNWARD THRUST BEARING TEMPERATURE	OPPD	
CP-3146	RC-3C UPWARD THRUST BEARING TEMPERATURE	OPPD	
CP-3147	RC-3C UPPER GUIDE BEARING TEMPERATURE	OPPD	
CP-3149	RC-3C OIL LIFT PERMISSIVE PRESSURE	OPPD	
CP-3161	RC-3D UPPER OIL RESERVOIR LEVEL CHANNEL 3161	OPPD	
CP-3162	RC-3D LOWER OIL RESERVOIR LEVEL CHANNEL 3162	OPPD	
CP-3163	RC-3D GUIDE BEARING TEMPERATURE	OPPD	
CP-3164	RC-3D STATOR WINDING TEMPERATURE	OPPD	
CP-3165	RC-3D DOWNWARD THRUST BEARING TEMPERATURE	OPPD	
CP-3166	RC-3D UP THRUST BEARING TEMPERATURE	OPPD	
CP-3167	RC-3D UPPER GUIDE BEARING TEMPERATURE	OPPD	
CP-3169	RC-3D OIL LIFT PERMISSIVE PRESSURE	OPPD	
CP-3193	R.C. 3A PUMP GASKET LEAK OFF PRESSURE	OPPD	
CP-3194	R.C. 3B PUMP GASKET LEAK OFF PRESSURE	OPPD	
CP-3195	R.C. 3C PUMP GASKET LEAK OFF PRESSURE	OPPD	
CP-3196	R.C. 3D PUMP GASKET LEAK OFF PRESSURE	OPPD	
D-23866-210-111	Reactor Coolant Pump P&ID	OPPD	10473

Document	Description	Source	GSE#
D-23866-210-111	Reactor Coolant Pump P&ID	OPPD	45591
D-23866-210-111	Reactor Coolant Pump P&ID	OPPD	45592
D-23866-210-111	Reactor Coolant Pump P&ID	OPPD	45593
SHB 23-26-3	Student Handbook - Reactor Coolant System	OPPD	
T-3147	RCP C Upper Guide Bearing Temperature Loop	OPPD	
11.52	Control Valve Specification Sheet	OPPD	15043
11.53	Control Valve Specification Sheet	OPPD	15044
11.83	Control Valve Specification Sheet	OPPD	15094
11405-E-30	Stored Energy System & Misc. Systems S.C. & I.	OPPD	12265
11405-E-31	Annunciator Schematics	OPPD	12266
11405-E-38	Waste Disposal System S.C. & I.	OPPD	12273
11405-E-52	Miscellaneous Schematics	OPPD	12236
11405-EM-130	Instrument and Control Equipment List	OPPD	43528
11405-EM-131	Instrument and Control Equipment List	OPPD	802
11405-EM-132	Instrument and Control Equipment List	OPPD	1566
11405-EM-133	Instrument and Control Equipment List	OPPD	803
11405-M-264 Sht. 3	Aux Building & Cont Instrument Air Diagram	OPPD	16954
11405-M-264 Sht. 4	Aux Building & Cont Instrument Air Diagram	OPPD	16292
11405-M-264 Sht. 5	Aux Building & Cont Instrument Air Diagram	OPPD	16293
11405-M-42	Auxiliary Gas Flow Diagram	OPPD	10450
11405-M-49	Auxiliary Gas Flow Diagram	OPPD	10611
11405-M-5	Demineralized Water System Flow Diagram	OPPD	10435
11405-M-6	Waste Disposal System Flow Diagram	OPPD	10436
11405-M-63	Waste Disposal System Flow Diagram	OPPD	10618
11405-M-98	Waste Disposal System Flow Diagram	OPPD	10452
161F561	Interconnection Diagram	OPPD	9476
1970	Control Valve Specification Sheet	OPPD	2299
23866-210-110	EHC LOAD CONTROL UNIT	OPPD	
23866-210-120	Sht. 1 EHC LOAD CONTROL UNIT	OPPD	
23866-210-130	Sht. 2 EHC LOAD CONTROL UNIT	OPPD	
598	Control Valve Specification Sheet	OPPD	45684
CP-103X	PRESSURIZER PRESSURE CHANNEL 103X	OPPD	
CP-103Y	PRESSURIZER PRESSURE CHANNEL 103Y	OPPD	
CP-130	QUENCH TANK WIDE RANGE PRESSURE	OPPD	
CP-131	QUENCH TANK NARROW RANGE PRESSURE	OPPD	

Document	Description	Source	GSE#
CP-132	QUENCH TANK LEVEL	OPPD	
CP-133	QUENCH TANK TEMPERATURE	OPPD	
D-4300 Sht. 1	Stator And Cooling Panel AI-134 Wiring Diagram	OPPD	31102
E-23866-210-110	Reactor Coolant System	OPPD	10475
E-2520-IC-437	Safety Injection and Containment Spray System	OPPD	
OP-10-A4-11	Operating Procedure - Annunciator Response Procedure	OPPD	
OP-10-A4-13	Operating Procedure - Annunciator Response Procedure	OPPD	
OP-10-A4-4	Operating Procedure - Annunciator Response Procedure	OPPD	
RC-2035 Sht. 1	Piping Isometric Diagrams	OPPD	8678
RC-2035 Sht. 2	Piping Isometric Diagrams	OPPD	8679
RC-2035 Sht. 3	Piping Isometric Diagrams	OPPD	8680
RC-2036 Sht. 1	Piping Isometric Diagrams	OPPD	8681
RC-2036 Sht. 3	Piping Isometric Diagrams	OPPD	8683
SD I-4	Pressurizer System Description	OPPD	
WD-2001	Piping Isometric Diagrams	OPPD	8904
WD-2002	Piping Isometric Diagrams	OPPD	8905
11.69	Control Valve Specification Sheet	OPPD	15074
11405-E-137	YCV-1045 S.C. & I.	OPPD	21423
11405-E-261	Turbine Generator Auxiliary System S.C. & I.	OPPD	12528
11405-E-28	Main Steam & Feed System S.C. & I.	OPPD	12263
11405-E-31	Annunciator Schematics	OPPD	12266
11405-E-44	Revision File Reference Data	OPPD	12279
11405-E-45	MCC Auto Load Shed & Misc S.C. & I.	OPPD	12280
11405-E-49	H2 Purge/Analyzer System S.C. & I.	OPPD	12284
11405-EM-1039	Instrument and Control Equipment List	OPPD	15770
11405-EM-951	Instrument and Control Equipment List	OPPD	15726
11405-M-252	Main Steam Flow Diagram	OPPD	10458
11405-M-264	Aux Bldg & Containment Instrument Air Diagram	OPPD	16293
11405-M-264	Aux Bldg & Containment Instrument Air Diagram	OPPD	16940
11405-M-264	Aux Bldg & Containment Instrument Air Diagram	OPPD	16954
13007.55-ESK-11A	125 VDC ELEM. DIAG. HC-921 & HC-922	OPPD	22613
136B2331	Index/Rev Sheet for Inst. Loop Diagrams	OPPD	7111
161F544	Feed Reg System Block Wiring Diagram - Train A	OPPD	94[illegible]
161F544	Feed Reg System Block Wiring Diagram - Train A	OPPD	9426
161F561	Interconnection Diagram	OPPD	24463

Document	Description	Source	GSE#
161F575	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9733
17.2	Instrumentation and Control Specification Sheet	OPPD	15164
17.2.01	Control Valve Specification Sheet	OPPD	15166
17.8	Control Valve Specification Sheet	OPPD	15172
20.4	Control Valve Specification Sheet	OPPD	15180
20.4	Control Valve Specification Sheet	OPPD	43030
542	Control Valve Specification Sheet	OPPD	45130
542	Control Valve Specification Sheet	OPPD	45131
543	Control Valve Specification Sheet	OPPD	45132
600	Control Valve Specification Sheet	OPPD	45686
8IN30237BD001A	Loop Dwg. A/LT-911	OPPD	22622
8IN30237BD001B	Loop Dwg. B/LT-911	OPPD	22626
8IN30237BD001C	Loop Dwg. C/LT-911	OPPD	22647
8IN30237BD001D	Loop Dwg. D/LT-911	OPPD	22640
8IN30237BD002A	Loop Dwg. A/PT-913	OPPD	22621
8IN30237BD002B	Loop Dwg. B/PT-913	OPPD	22625
8IN30237BD002C	Loop Dwg. C/PT-913	OPPD	22646
8IN30237BD002D	Loop DWG. D/PT-913	OPPD	22639
8IN30237BD003A	Loop Dwg. A/LT912	OPPD	22620
8IN30237BD003B	Loop Dwg. B/LT912	OPPD	22624
8IN30237BD003C	Loop Dwg. C/LT-912	OPPD	22648
8IN30237BD003D	Loop Dwg. D/LT-912	OPPD	22368
8IN30237BD004A	Loop Dwg. A/PT-914	OPPD	22619
8IN30237BD004B	Loop Dwg. B/PT-914	OPPD	22623
8IN30237BD004C	Loop Dwg. C/PT-914	OPPD	22649
8IN30237BD004D	Loop Dwg. D/PT-914	OPPD	22637
A8ENGR	Annunciator A-66-A Engraving List	Westinghouse	
B-4101	ERF Computer Analog Point Input List	OPPD	31487
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CP-326	SHUTDOWN COOLING RETURN FLOW	[illegible]	
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11.19	Control Valve Specification Sheet	OPPD	14986
11.19	Control Valve Specification Sheet	OPPD	42943
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11.[illegible]	Control Valve Specification Sheet	OPPD	14992
11.22	Control Valve Specification Sheet	OPPD	43046
11.23	Control Valve Specification Sheet	OPPD	14994
11.23	Control Valve Specification Sheet	OPPD	43047
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11405-M-264	Aux Bldg & Containment Instrument Air Diagram	OPPD	16293
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161F598	Panel AI-30B, Diesel Sequencer Safety and Test B	OPPD	9811
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AC-2010	AC Piping Isometric Diagram	OPPD	7311
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B-4102	ERF Computer Analog Point Input List	OPPD	37450
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B-4111	QSPDS B Data Link Analog Computer Points	OPPD	37822
CP-2800	CC WATER PUMPS DISCHARGE HEADER TEMPERATURE	OPPD	
CP-2801	CC WATER SURGE TANK LEVEL CHANNEL 2801	OPPD	

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CP-2802	CCW SURGE TANK PRESSURE	OPPD	
CP-2831	CCW FROM LETDOWN HEAT EXCHANGER FLOW	OPPD	
CP-2858	AUX. COOLING LEAVING CRDM'S FLOW	OPPD	
CP-2860	CCW LEAVING CEDM'S TEMPERATURE	OPPD	
CP-400C	AC TO CONTAINMENT COOLING UNIT HCV-400C	OPPD	
CP-401C	AC TO CONTAINMENT COOLING UNIT HCV-401C	OPPD	
CP-402C	AC TO CONTAINMENT COOLING UNIT HCV-402C	OPPD	
CP-403C	AC TO CONTAINMENT COOLING UNIT HCV-403C	OPPD	
CP-412	CCW 60 PSIG PRESSURE SENSOR	OPPD	
CP-413	CCW 60 PSIG PRESSURE SENSOR	OPPD	
CP-416	CC WATER FROM CONTAINMENT COOLING UNIT FLOW	OPPD	
CP-417	CC WATER FROM CONTAINMENT COOLING UNIT FLOW	OPPD	
CP-418	CC WATER FROM CONTAINMENT COOLING UNIT FLOW	OPPD	
CP-419	CC WATER FROM CONTAINMENT COOLING UNIT FLOW	OPPD	
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CP-422	CC WATER FROM CONTAINMENT COOLING UNIT TEMPERATURE	OPPD	
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CP-434	AUX COOLING WATER FROM SI TANK LEAKAGE COOLER FLOW	OPPD	
CP-435	AUX COOLING WATER FROM SI TANK LEAKAGE COOLER FLOW	OPPD	
CP-436	AUX COOLING WATER FROM SI TANK LEAKAGE COOLER FLOW	OPPD	
CP-437	AUX COOLING WATER FROM SI TANK LEAKAGE COOLER FLOW	OPPD	
CP-450	CC WATER LEAVING R C PUMP SEAL COOLING UNIT FLOW	OPPD	
CP-451	CC WATER LEAVING R C PUMP SEAL COOLER FLOW	OPPD	
CP-452	CC WATER LEAVING R C PUMP SEAL COOLER FLOW	OPPD	
CP-453	CC WATER LEAVING R C PUMP SEAL COOLING UNIT FLOW	OPPD	
CP-454	CC WATER LEAVING R C PUMP LUBE OIL COOLER FLOW	OPPD	
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CP-460	CC WATER LEAVING RC-3C SEAL COOLER TEMPERATURE	OPPD	
CP-461	CC WATER LEAVING RC-3D SEAL COOLER TEMPERATURE	OPPD	
CP-462	CC WATER LEAVING RC-3A LUBE OIL COOLER TEMPERATURE	OPPD	

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CP-463	CC WATER LEAVING RC-3B LUBE OIL COOLER TEMPERATURE	OPPD	
CP-464	CC WATER LEAVING RC-3C LUBE OIL COOLER TEMPERATURE	OPPD	
CP-465	CC WATER LEAVING RC-3D LUBE OIL COOLER TEMPERATURE	OPPD	
CP-470	CC WATER FROM COOLING COIL VA-14A	OPPD	
CP-471	CC WATER FROM COOLING COIL VA-14B	OPPD	
CP-472	CC WATER FROM COOLING COIL VA-14A TEMPERATURE	OPPD	
CP-473	CC WATER FROM COOLING COIL VA-14B TEMPERATURE	OPPD	
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CP-486	CC WATER FROM SHUTDOWN HEAT EXCHANGER AC-4A TEMP	OPPD	
CP-487	CC WATER FROM SHUTDOWN HEAT EXCHANGER AC-4B TEMP	OPPD	
CP-493	CC WATER FROM HEAT EXCHANGER AC-1A TEMPERATURE	OPPD	
CP-494	CC WATER FROM HEAT EXCHANGER AC-1B TEMPERATURE	OPPD	
CP-495	CC WATER FROM HEAT EXCHANGER AC-1C TEMPERATURE	OPPD	
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CP-498	CC WATER PUMP DISCHARGE FLOW	OPPD	
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D-23866-210-111	Reactor Coolant Pump P&ID	OPPD	10473
D-23866-210-111	Reactor Coolant Pump P&ID	OPPD	45591
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CP-2846	SPENT FUEL POOL LEVEL	OPPD	
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11405-E-337	Elem. Diag. - Annunciator Schematics	OPPD	12599
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11405-M-264	Aux Bldg & Containment Instrument Air Diagram	OPPD	16292
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11405-EM-1304	Instrument and Control Equipment List	OPPD	15858
11405-EM-3200/3277	Instrument Loop Elementary	OPPD	16092
11405-EM-957/958	Instrument and Control Equipment List	OPPD	15734
11405-EM-961/962	Instrument and Control Equipment List	OPPD	15738
11405-EM-965/966	Instrument and Control Equipment List	OPPD	15742
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11405-M-252	Main Steam Flow Diagram	OPPD	10458
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233R964	Turbine Contr [illegible] Diagram	OPPD	31065
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CP-953A	STEAM ENTERING STEAM SEPARATOR NO. 1 PRESSURE	OPPD	
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947D338	Universal Digital Ratemeter 946A-100 Instructions	OPPD	67[illegible]
947D338	Universal Digital Ratemeter 946A-100 Instructions	OPPD	675[illegible]
947D338	Universal Digital Ratemeter 946A-100 Instructions	OPPD	67[illegible]
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CP-3250	TURBINE SHAFT VIBRATION CHANNEL NO. 8	OPPD	
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CP-3252	TURBINE SHAFT VIBRATION CHANNEL NO. 10	OPPD	
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11405-E-12	4.16 KV Htr Drn Pump Bkr FW-5A	OPPD	12248
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11405-EM-1170	Instrument and Control Equipment List	OPPD	22384
11405-EM-1172	Instrument and Control Equipment List	OPPD	15815
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234R311	Stator Winding Cooling Water P&ID	OPPD	10001
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A15ENGR	Annunciator A-15 Engraving List	Westinghouse	
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OP-10-A15	Operating Procedure - Annunciator Response Procedure	OPPD	
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11405-E-337	Elem. Diag. - Annunciator Schematics	OPPD	12599
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A15ENGR	Annunciator A-15 Engraving List	Westinghouse	
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A16ENGR	Annunciator A-16 Engraving List	Westinghouse	
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161F597	Panel AI-30A, Diesel Sequencer Safety and Test A	OPPD	9805
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A32ENGR	Annunciator A-32 Engraving List	Westinghouse	
A35ENGR	Annunciator A-35 Engraving List	Westinghouse	
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SD III-7	Turbine Lubricating Oil System Description	OPPD	
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11405-M-254	Condensate Flow Diagram	OPPD	10460
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11405-M-302	Demineralized Water System Flow Diagram	OPPD	10731
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234R311	Stator Winding Cooling Water P&ID	OPPD	10001
949-D-151	Digital Ratemeter Models 946A-100 Instruction Manual	OPPD	
949D151	Turbine Generator Gas Control P&ID	OPPD	6765
949D154	Turbine Generator P&ID	OPPD	6768
A10ENGR	Annunciator A-10 Engraving List	Westinghouse	
A14ENGR	Annunciator A-14 Engraving List	Westinghouse	
CP-1287	STATOR COOLING WATER LOW FLOW ALARM & UNIT TRIP	OPPD	
CP-1288	STATOR COOLING WATER LOW FLOW ALARM & UNIT TRIP	OPPD	
CP-2650	GENERATOR H2 PRESSURE	OPPD	
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CP-5032	STATOR COOLING WATER OUTLET HIGH TEMPERATURE	OPPD	
CP-5044	STATOR COOLING WATER TANK LEVEL	OPPD	
CP-5045	STATOR COOLING WATER PUMP DISCHARGE PRESSURE	OPPD	
CP-5125	SEAL OIL VACUUM TANK LEVEL	OPPD	
CP-5128	EMERGENCY SEAL OIL PUMP MOTOR START INSTRUMENTATION	OPPD	

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CP-5141	HYDROGEN COLD GAS TEMPERATURE	OPPD	
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11405-E-121	Emergency Alarm System EE-32	OPPD	20607
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11405-E-342	Secondary Plant Misc. Equipment S.C. & I -Sheet 3	OPPD	12604
11405-M-259	Flow Diagram Potable & Service Water	OPPD	10465
11405-M-266	Fire Protection Deluge System Details	OPPD	19615
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161F575	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9721
161F575	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9722
A14ENGR	Annunciator A-14 Engraving List	Westinghouse	
A16ENGR	Annunciator A-16 Engraving List	Westinghouse	
A17ENGR	Annunciator A-17 Engraving List	Westinghouse	
A18ENGR	Annunciator A-18 Engraving List	Westinghouse	
CP-1652	FIRE MAIN HEADER PRESSURE	OPPD	
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FIG. 8.1-1	Plant Electrical System One Line Diagram	OPPD	12234
SD III-16	Fire Protection System Description	OPPD	
SD III-8	Fire Protection System Description	OPPD	

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11405-E-28	Main Steam & Feed System S.C. & I.	OPPD	12263
11405-E-31	Annunciator Schematics	OPPD	12266
11405-EM-101	Instrument and Control Equipment List	OPPD	10227
11405-EM-101	Instrument and Control Equipment List	OPPD	16956
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11405-EM-103	Instrument and Control Equipment List	OPPD	1567
11405-EM-103	Instrument and Control Equipment List	OPPD	1568
11405-EM-111	Instrument and Control Equipment List	OPPD	15626
11405-EM-121	Instrument and Control Equipment List	OPPD	800
11405-EM-269	Instrument and Control Equipment List	OPPD	11654
11405-EM-903	Instrument and Control Equipment List	OPPD	15720
11405-EM-906	Instrument and Control Equipment List	OPPD	21368
136B2432	Elementary Diagram - Switch Development	OPPD	5730
136B2432	Elementary Diagram - Switch Development	OPPD	5745
136B2432	Elementary Diagram - Switch Development	OPPD	5746
136B2432	Elementary Diagram - Switch Development	OPPD	5754
136B2492	480V Controls & Elementary Diagrams	OPPD	5756
136B3082	Annunciator A-8 Field Contacts	OPPD	6273
161F544	Feed Reg System Block Wiring Diagram - Train A	OPPD	9424
161F544	Feed Reg System Block Wiring Diagram - Train A	OPPD	9425
161F544	Feed Reg System Block Wiring Diagram - Train A	OPPD	9426
161F549	Elem. Diagram - Reactor Regulating System	OPPD	9429
161F549	Elem. Diagram - Reactor Regulating System	OPPD	9430
161F561	Interconnection Diagram	OPPD	9476
161F561	Interconnection Diagram	OPPD	9503
161F561	Interconnection Diagram	OPPD	9512
161F561	Interconnection Diagram	OPPD	9513
161F561	Interconnection Diagram	OPPD	9551
161F561	Interconnection Diagram	OPPD	9554
161F594	Rod Drive Control System Interconnection Diagram	OPPD	9791
161F594	Rod Drive Control System Interconnection Diagram	OPPD	9792
161F594	Rod Drive Control System Interconnection Diagram	OPPD	9793
161F594	Rod Drive Control System Interconnection Diagram	OPPD	9794
161F594	Rod Drive Control System Interconnection Diagram	OPPD	9795
161F594	Rod Drive Control System Interconnection Diagram	OPPD	9796

Document	Description	Source	GSE#
161F594	Rod Drive Control System Interconnection Diagram	OPPD	9797
161F594	Rod Drive Control System Interconnection Diagram	OPPD	9798
161F594	Rod Drive Control System Interconnection Diagram	OPPD	10266
B-23866-414-360	Schematic Diagram - Electro Pneumatic Throttle Valves	OPPD	1259
B-23866-414-377	Schematic Diagram - Pilot Solenoid Operated Valves	OPPD	1276
CP-101X	PRESSURIZER LEVEL	OPPD	
CP-101Y	PRESSURIZER LEVEL	OPPD	
CP-103X	PRESSURIZER PRESSURE CHANNEL 103X	OPPD	
CP-103Y	PRESSURIZER PRESSURE CHANNEL 103Y	OPPD	
CP-105/123	PRESSURIZER PRESSURE WIDE RANGE CHANNEL B	OPPD	
CP-113/115	PRESSURIZER PRESSURE WIDE RANGE CHANNEL C	OPPD	
CP-909	STEAM DUMP CONTROL AND QUICK OPENING OVERRIDE CHANNEL	OPPD	
CP-RRS	CALIBRATION PROCEDURE - RRS	OPPD	
D-23866-413-001	Reactor Coolant Pump P&ID	OPPD	1375
D-4158	LTOP	OPPD	37776
D-4159	Schematic Diagram - Solenoid Operated Valves	OPPD	37777
D-W-1537N-240	RRS Design Basis Document Review Comments	OPPD	
E-23866-413-075	Safety Injection and Containment Spray System	OPPD	1617
FIG.7.4-6	Steam Dump & Bypass System Block Diagram	OPPD	36561
SD I-4 RCS	Reactor Coolant System Description	OPPD	
SD I-5	Chemical and Volume Control System Description	OPPD	
SD III-3	Condensate and Feedwater System Description	OPPD	
11405-E-120	4.16 KV Htr Drn Pump Bkr FW-5A	OPPD	40239
11405-E-120	4.16 KV Htr Drn Pump Bkr FW-5A	OPPD	40240
11405-E-190	4160 Volt Switchgear Schematics	OPPD	12426
11405-E-191	4160 Volt Switchgear Schematics	OPPD	12427
11405-E-192	4160 Volt Switchgear Schematics	OPPD	12428
11405-E-193	4160 Volt Switchgear Schematics	OPPD	12429
11405-E-193A	4160 Volt Switchgear Schematics	OPPD	23159
11405-E-31	Annunciator Schematics	OPPD	12266
11405-E-404	Post Accident Monitoring Panel AI-66A	OPPD	23592
11405-E-405	Post Accident Monitoring Panel AI-66B	OPPD	23591
C-23866-411-003	Joy Series 1000 Axivane Fan Model 29 Manual	OPPD	1294
CP-A RPS/DT METER	ALTERNATOR ARMATURE SLOT TEMPERATURE	OPPD	
CP-B RPS/DT METER	STEAM GENERATOR B WIDE RANGE PRESSURE	OPPD	

Document	Description	Source	GSE#
CP-D RPS/DT METER	STEAM GENERATOR B WIDE RANGE PRESSURE	OPPD	
D-23866-411-027	Reactor Coolant Pump P&ID	OPPD	1356
D-23866-411-031	Reactor Coolant Pump P&ID	OPPD	1359
D-23866-411-062	Reactor Coolant Pump P&ID	OPPD	23158
D-23866-413-352	Reactor Coolant Pump P&ID	OPPD	1379
E-23866-411-003	Safety Injection and Containment Spray System	OPPD	1582
E-23866-411-012	Safety Injection and Containment Spray System	OPPD	23160
E-23866-411-012	Safety Injection and Containment Spray System	OPPD	23161
E-23866-411-012	Safety Injection and Containment Spray System	OPPD	23162
E-23866-411-012	Safety Injection and Containment Spray System	OPPD	23163
E-23866-411-012	Safety Injection and Containment Spray System	OPPD	23164
E-23866-411-013	Safety Injection and Containment Spray System	OPPD	1584
E-23866-411-013	Safety Injection and Containment Spray System	OPPD	1585
E-23866-411-013	Safety Injection and Containment Spray System	OPPD	1586
E-23866-411-013	Safety Injection and Containment Spray System	OPPD	1587
E-23866-411-039	Safety Injection and Containment Spray System	OPPD	1597
E-23866-411-040	Safety Injection and Containment Spray System	OPPD	1598
E-23866-411-043	Safety Injection and Containment Spray System	OPPD	1599
E-23866-411-061	Safety Injection and Containment Spray System	OPPD	23156
E-23866-411-064	Safety Injection and Containment Spray System	OPPD	1600
E-23866-411-064	Safety Injection and Containment Spray System	OPPD	1601
E-23866-411-302	Safety Injection and Containment Spray System	OPPD	23157
E-23866-411-310	Safety Injection and Containment Spray System	OPPD	1605
E-23866-411-323	Safety Injection and Containment Spray System	OPPD	1606
E-23866-411-324	Safety Injection and Containment Spray System	OPPD	1607
E-23866-411-325	Safety Injection and Containment Spray System	OPPD	1608
E-23866-411-400	Safety Injection and Containment Spray System	OPPD	1611
E-23866-411-401	Safety Injection and Containment Spray System	OPPD	1612
E-4088	D.S.S. Channel A & B Matrix Diagram	OPPD	43616
OP-10-A20	Operating Procedure - Annunciator Response Procedure	OPPD	
RPS VOL I	RPS Technical Manual	OPPD	
RPS VOL II	RPS Technical Manual	OPPD	
SHB 23-26-15	Reactor Protective System Student Handbook	OPPD	
11405-E-25	Annunciator Schematics	OPPD	12260
11405-E-31	Annunciator Schematics	OPPD	12266

Document	Description	Source	GSE#
11405-E-338	Elem. Diag. - Annunciator Schematics	OPPD	12600
11405-E-339	Elem. Diag. - Annunciator Schematics	OPPD	12601
11405-E-404	Post Accident Monitoring Panel AI-66A	OPPD	23592
11405-E-405	Post Accident Monitoring Panel AI-66B	OPPD	23591
136B3219	Electrical Control Valve & Pump Index	OPPD	6350
161F596	Elem. Diagram - Steam Gen. Pressure Initiation Matrix	OPPD	9800
161F597	Panel AI-30A, Diesel Sequencer Safety and Test A	OPPD	9801
161F598	Panel AI-30B, Diesel Sequencer Safety and Test B	OPPD	9811
161F598	Panel AI-30B, Diesel Sequencer Safety and Test B	OPPD	9816
161F598	Panel AI-30B, Diesel Sequencer Safety and Test B	OPPD	9817
161F598	Panel AI-30B, Diesel Sequencer Safety and Test B	OPPD	9818
161F598	Panel AI-30B, Diesel Sequencer Safety and Test B	OPPD	9819
161F599	Panel AI-30B, Diesel Sequencer Safety and Test B	OPPD	9821
161F609	Elem. Diagram - Pressurizer Low Pressure Matrix A & B	OPPD	9829
161F611	Elem. Diagram - Pressurizer Low Pressure Matrix A & B	OPPD	9831
161F615	Cont. Hi Press & SIRWT Lo 2/4 Matrices A & B Schematic	OPPD	9841
A17ENGR	Annunciator A-17 Engraving List	Westinghouse	
A18ENGR	Annunciator A-18 Engraving List	Westinghouse	
B120F14501	Schematic - Engine Control	OPPD	17396
CP-A/913	STEAM GENERATOR A WIDE RANGE PRESSURE	OPPD	
CP-A/914	STEAM GENERATOR B WIDE RANGE PRESSURE	OPPD	
CP-B/913	STEAM GENERATOR A WIDE RANGE PRESSURE	OPPD	
CP-B/914	STEAM GENERATOR B WIDE RANGE PRESSURE	OPPD	
CP-C/913	STEAM GENERATOR A WIDE RANGE PRESSURE	OPPD	
CP-C/914	STEAM GENERATOR B WIDE RANGE PRESSURE	OPPD	
CP-D/913	STEAM GENERATOR A WIDE RANGE PRESSURE	OPPD	
CP-D/914	STEAM GENERATOR B WIDE RANGE PRESSURE	OPPD	
D-4074	Generator Condition Monitor Remote Panel Layout	OPPD	16262
E-4027	ELEM. DIAGRAM - OFF-SITE POWER LOW VOLTAGE MATRIX	OPPD	16951
E-4043	ELEM. DIAG. - AFW ACTUATION FROM RC-2A MATRIX	OPPD	16143
E-4043	ELEM. DIAG. - AFW ACTUATION FROM RC-2A MATRIX	OPPD	16144
E-4044	ELEM. DIAG. - AFW ACTUATION FROM RC-2A MATRIX	OPPD	16145
E-4044	ELEM. DIAG. - AFW ACTUATION FROM RC-2A MATRIX	OPPD	16146
OP-10-A31/32	Operating Procedure - Annunciator Response Procedure	OPPD	
SD II-7	Engineered Safeguards System Description	OPPD	

Document	Description	Source	GSE#
11405-E-31	Annunciator Schematics	OPPD	12266
11405-EM-001/010	120 Volt AC Instrument Buses One Line Diagram	OPPD	15433
161F561	Interconnection Diagram	OPPD	9476
161F561	Interconnection Diagram	OPPD	9562
161F561	Interconnection Diagram	OPPD	9563
161F561	Interconnection Diagram	OPPD	9564
161F561	Interconnection Diagram	OPPD	22681
161F575	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9731
161F591	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9777
161F591	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9779
161F594	Rod Drive Control System Interconnection Diagram	OPPD	10266
A20ENGR	Annunciator A-20 Engraving List	Westinghouse	
D-23866-411-100	Nuclear Instrumentation System Functional Diagram	OPPD	1363
E-23866-411-021	NI & RPS Cabinet Front Panel Layout	OPPD	1589
E-23866-411-102	Neutron Flux Monitoring System Wide Range Log Channel	OPPD	1602
E-23866-411-103	Neutron Flux Monitoring System Power Range Channel	OPPD	1603
Gulf NIS Man V III	Gulf Atomic Technical Manual	OPPD	25824
Gulf NIS Man. V I	Gulf Atomic Technical Manual	OPPD	25822
Gulf NIS Man. V II	Gulf Atomic Technical Manual	OPPD	25823
LINEAR POWER	LINEAR POWER CHANNEL TECHNICAL MANUAL	OPPD	
LP-7-12-18	Nuclear Instrumentation Student Lesson Plan	OPPD	
LP-7-12-19	Nuclear Instrumentation Student Lesson Plan	OPPD	
OI-NI	Operation of the Excore Nuclear Instrumentation System	OPPD	
OP-10-A20	Operating Procedure - Annunciator Response Procedure	OPPD	
OP-7	OPERATING PROCEDURE - REACTOR STARTUP - Part 1	OPPD	
SHB 23-26-5	Nuclear Instrumentation Student Handbook	OPPD	
ST-RPS-1	Power Range Safety Channels	OPPD	41189
ST-RPS-2	Wide Range Logarithmic Channels	OPPD	23957
B-4101	ERF Computer Analog Point Input List	OPPD	31487
B-4108	QSPDS A Data Link Analog Computer Points	OPPD	37813
B-4109	QSPDS B Data Link Analog Computer Points	OPPD	37816
B-4049	QSPDS Plasma Display Pages View	OPPD	23555
B-4101	ERF Computer Analog Point Input List	OPPD	31487
B-4108	QSPDS A Data Link Analog Computer Points	OPPD	37813
B-4109	QSPDS B Data Link Analog Computer Points	OPPD	37816

Document	Description	Source	GSE#
SD II-8	Incore Nuclear Instrumentation System Description	OPPD	
11405-E-25	ANNUNCIATOR SCHEMATICS	OPPD	12260
11405-E-31	Annunciator Schematics	OPPD	12266
11405-E-406	RM Panel AI-33C Annunciator &Elem.	OPPD	22662
11405-EM-214	Instrument and Control Equipment List	OPPD	845
11405-M-1	Cont HVAC Flow Diagram	OPPD	10431
11405-M-10	Aux Coolant Component Cooling Flow Diagram	OPPD	10440
11405-M-100	Raw Water Flow Diagram	OPPD	10454
11405-M-12	Primary Plant Sampling System Flow Diagram	OPPD	10442
11405-M-252	Main Steam Flow Diagram	OPPD	10458
11405-M-261	Flow Diagram Condenser Evacuation & H2 - CO2 Piping	OPPD	10468
11405-M-43	Auxiliary Gas Flow Diagram	OPPD	10447
11405-M-9	Waste Disposal System Flow Diagram	OPPD	10439
13007.55-EE-2B-2	125VDC Panel AI-65B H2 Analyzer Elementary	OPPD	37714
161F561	Interconnection Diagram	OPPD	9476
161F561	Interconnection Diagram	OPPD	9479
161F575	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9728
161F575	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9729
161F575	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9730
161F584	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9769
161F591	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9779
903546	System Wiring, Process RadMonitor	OPPD	18276
904531	RM-060 Vent Stack Fan Control	OPPD	18293
904654	Process Monitor Stack 1 Detector Wiring	OPPD	18295
910658	Process Monitor Stack 1 Detector Wiring	OPPD	37706
911105	Process Monitor Stack 1 Detector Wiring	OPPD	37710
911106	Process Monitor Stack 1 Detector Wiring	OPPD	37707
911106	Process Monitor Stack 1 Detector Wiring	OPPD	37708
911107	Process Monitor Stack 1 Detector Wiring	OPPD	37709
911584	Process Monitor Stack 1 Detector Wiring	OPPD	37711
911585	Process Monitor Stack 1 Detector Wiring	OPPD	37697
942A-100-1	Victoreen Digital Ratemeter 942A Tech Manual	OPPD	
946A-100-1B	Victoreen Digital Ratemeter 946A-100 Instructions	OPPD	
A2ENGR	Annunciator A-2 Engraving List	Westinghouse	
A39ENGR	Annunciator A-39 Engraving List	Westinghouse	

Document	Description	Source	GSE#
A4ENGR	Annunciator A-4 Engraving List	Westinghouse	
B-4101	ERF Computer Analog Input List	OPPD	31487
B-4102	ERF Computer Analog Point Input List	OPPD	37450
B-4108	QSPDS A Data Link Analog Computer Points	OPPD	37813
B-4109	QSPDS B Data Link Analog Computer Points	OPPD	37816
CP-057	CONDENSER OFFGAS MONITOR CALIBRATION	OPPD	
CP-063F	POST ACCIDENT WR NOBLE GAS SAMPLER CALIBRATION	OPPD	
CP-214	SECONDARY & PRIMARY CAL FOR FAILED FUEL MONITOR	OPPD	
CP-54A	S/G A BLOWDOWN MONITOR CALIBRATION	OPPD	
CP-54B	S/G B BLOWDOWN MONITOR CALIBRATION	OPPD	
E-23866-210-120	Chemical and Volume Control	OPPD	10477
11405-E-25	Annunciator Schematics	OPPD	12260
11405-E-31	Annunciator Schematics	OPPD	12266
11405-E-336	Elem. Diag. - Annunciator Schematics	OPPD	12598
11405-E-337	Elem. Diag. - Annunciator Schematics	OPPD	12599
11405-E-338	Elem. Diag. - Annunciator Schematics	OPPD	12600
11405-E-339	Elem. Diag. - Annunciator Schematics	OPPD	12601
11405-E-402	Post Accident Monitoring Panel AI-65A	OPPD	23655
11405-E-403	Post Accident Monitoring Panel AI-65B	OPPD	23658
11405-E-404	Post Accident Monitoring Panel AI-66A	OPPD	23592
11405-E-405	Post Accident Monitoring Panel AI-66B	OPPD	23591
11405-E-406	RM Panel AI-33C Annunciator & Elem.	OPPD	22662
11405-EM-1700/1701	Instrument and Control Equipment List	OPPD	15910
161F575	Elem. Diag. - Annunciator Schemes A1 & A2	OPPD	9729
161F597	Panel AI-30A, Diesel Sequencer Safety and Test A	OPPD	9801
161F598	Panel AI-30B, Diesel Sequencer Safety and Test B	OPPD	9811
A10ENGR	Annunciator A-10 Engraving List	Westinghouse	
A11ENGR	Annunciator A-11 Engraving List	Westinghouse	
A12ENGR	Annunciator A-12 Engraving List	Westinghouse	
A13ENGR	Annunciator A-13 Engraving List	Westinghouse	
A14ENGR	Annunciator A-14 Engraving List	Westinghouse	
A15ENGR	Annunciator A-15 Engraving List	Westinghouse	
A16ENGR	Annunciator A-16 Engraving List	Westinghouse	
A17ENGR	Annunciator A-17 Engraving List	Westinghouse	
A18ENGR	Annunciator A-18 Engraving List	Westinghouse	

Document	Description	Source	GSE#
A19ENGR	Annunciator A-19 Engraving List	Westinghouse	
A1ENGR	Annunciator A-1 Engraving List	Westinghouse	
A20ENGR	Annunciator A-20 Engraving List	Westinghouse	
A21ENGR	Annunciator A-21 Engraving List	Westinghouse	
A2ENGR	Annunciator A-2 Engraving List	Westinghouse	
A30ENGR	Annunciator A-30 Engraving List	Westinghouse	
A31ENGR	Annunciator A-31 Engraving List	Westinghouse	
A32ENGR	Annunciator A-32 Engraving List	Westinghouse	
A33-1ENG	Annunciator A-33-1 Engraving List	Westinghouse	
A33-2ENG	Annunciator A-33-2 Engraving List	Westinghouse	
A34-1ENG	Annunciator A-34-1 Engraving List	Westinghouse	
A34-2ENG	Annunciator A-34-2 Engraving List	Westinghouse	
A35ENGR	Annunciator A-35 Engraving List	Westinghouse	
A36ENGR	Annunciator A-36 Engraving List	Westinghouse	
A37ENGR	Annunciator A-37 Engraving List	Westinghouse	
A38ENGR	Annunciator A-38 Engraving List	Westinghouse	
A39ENGR	Annunciator A-39 Engraving List	Westinghouse	
A40ENGR	Annunciator A-40 Engraving List	Westinghouse	
A41ENGR	Annunciator A-41 Engraving List	Westinghouse	
A4ENGR	Annunciator A-4 Engraving List	Westinghouse	
A65AENGR	Annunciator A-65-A Engraving List	Westinghouse	
A65BENGR	Annunciator A-65-B Engraving List	Westinghouse	
A66AENGR	Annunciator A-66-A Engraving List	Westinghouse	

Design Reference Documents:

Excerpt from Steam Generator Technical Manual for Fort Calhoun Station	Unit No. 1, Data Void Request #VFCS0024	OPPD
Fort Calhoun Station Unit 1 Updated Safety Analysis Report Rev. 1		OPPD
Fort Calhoun Station Simulator Malfunction Descriptions		OPPD
Fluid Mechanics, Frank M. White, McGraw-Hill, 1979		Westinghouse
IMB	Design Basis and Model Documentation The Interactive Model Builder (IMB) Handbook IMB 13.10	Westinghouse
IMB	Design Basis and Model Documentation The Interactive Model Builder (IMB) Handbook IMB 10.5.1	Westinghouse
IMB	Design Basis and Model Documentation Interactive Model Builder Modules 10.5.2	Westinghouse
Letter D-W-1537N-149, "RCS Data Request", R.P. Clemens of OPPD to S.S. Khwaja	of Westinghouse, July 13, 1988.	Westinghouse
Letter D-W-1537N-141, "Auxiliary Feedwater Pump FW-6, Pump Curve",	R. P. Clemens, June 29, 1988.	Westinghouse
Letter	USER #83-02, "Least Square Polynomial Curve Fitting", Shooo-Dyi Yeh, Jan. 11, 1983	Westinghouse
Marks, L. S. Mechanical Engineer's Handbook, Fourth Edition. New York: McGraw	Hill Book Company, Inc., 1941.	Westinghouse
Meter Scale List	Meter Faceplate Scale Data	Westinghouse

Meyer, C. A., McClintock, R. B., Silvestri, G. J., and Spencer, R. J. Jr. ASME Steam Tables, Fourth Edition. New York: The American Society of Mechanical Engineers, 1967. — Westinghouse

Operating Manual Technical Data Book, Volume 1, Fort Calhoun Station, Unit No. 1, III-20, "RCS Elevations vs. Tygon Tube, LI-106 LI-197", Revised 05/04/87 — OPPD

100% Power Point Summary 4/17/89 12:38:52 FCS ERF Data Point Scan — OPPD

Plant Startup Data taken 5/16/89 — OPPD

Reactor Core Data Transmitted 1988. — OPPD

RMS Notes - 942A Notes on the 942A Area Monitors by M. L. Ellis — OPPD

RMS Notes - 946A Notes on the 946A Area Monitors by M. L. Ellis — OPPD

Systems Description for Fort Calhoun Station Unit No. 1, Volume 1, Section 4, "Reactor Coolant System" — OPPD

Standard Handbook for Mechanical Engineers, Theodore Baumeister, McGraw-Hill, 1967. — Westinghouse

Tong, L. S. and Weisman, J. Thermal Analysis of Pressurized Water Reactors, Second Edition. LaGrange Park: American Nuclear Society, 1979. — Westinghouse

Updated Safety Analysis Report for Fort Calhoun Station Unit No. 1, Volume 2, Section 4 — OPPD

Van Wylen, G. J. and Sonntag, R. E. Fundamentals of Classical Thermodynamics, 2nd Edition. New York: John Wilely and Sons, Inc., 1973. — Westinghouse

Wallis, G. B. One-Dimensional Two-Phase Flow. New York: McGraw-Hill, 1969. — Westinghouse

Weast, Robert C.	CRC Handbook of Chemistry and Physics, 57th Edition. Cleveland: CRC Press, 1976.	Westinghouse
Zaloudek, F. R.	"Critical Flow of Hot Water Through Short Tubes." Atomic Energy Commission Research and Development Report, HW-77594, General Electric Corporation, 1963.	Westinghouse
120VAC LOAD STUDY	Fort Calhoun 120V AC Load Study	OPPD
125VDC LOAD STUDY	Fort Calhoun 125V DC Load Study	OPPD
480VAC LOAD STUDY	Fort Calhoun 480V Load Study	OPPD
4160VAC LOAD STUDY	Fort Calhoun 4.16KV Load Study	OPPD

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION

Simulator Certification Submittal

Section 3

OMAHA PUBLIC POWER DISTRICT
FORT CALHOUN STATION

Simulator Certification Submittal
Section 3

3.1 INTRODUCTION

The purpose of this Section is to present the documentation for the Simulator Performance Testing pursuant to ANSI/ANS-3.5-1985, Section 5.4.1(1), "Completion of initial construction." A representative sample of this documentation is presented as Simulator Performance Test Abstracts, attached as Appendix 3.A, and described below.

3.2 SIMULATOR TEST PROGRAM DOCUMENTS

The Test Program documentation can be encapsulated by the following simulator documents:

- Simulator Acceptance Test Procedures (ATPs), Section 14 of FCS Simulator Documentation;
- Simulator Malfunction Cause and Effect (MC&E) Sheets, Section 6.3.4 of FCS Simulator Documentation; and
- Simulator Trouble Report (TR) Data

The preceding documents are discussed below.

3.2.1 Simulator ATPs

The ATPs were written in collaboration with Westinghouse, to test all aspects of simulator design, and to compare those aspects with Fort Calhoun Station characteristics, based on the Design Process described in Section 2. The scope of testing addressed by the ATP's exceeds the guidance of ANSI/ANS-3.5-1985, Appendix A3, "Simulator Tests." Each ATP describes and documents a single test.

Following the ATP cover page, the overall Test Status is documented with an entry from the OPPD Acceptance Test Procedure Status Report database. This Report contains the Test Number, Title, report Date, a listing of TRs written pursuant to the test, Test Results, and signature blocks for test acceptance. The appropriate Test Results are checked from the following selections:

1. Test completed satisfactorily.
2. After correction of above discrepancies and retests are satisfactory, the test is completed satisfactorily.
3. Test results unsatisfactory, a complete retest is necessary.

Immediately after the Status Report, the body of each ATP describes the method of test conduct, and provides initial blocks to document the test results. The ATPs can be broadly categorized as either Non-Malfunction or Malfunction.

The 190 Non-Malfunction ATPs include the following types of tests:

- Hardware (e.g., panel and instrument inspection and verification, I/O Operation, Overtemperature trip)
- Computer System (e.g., verification of spare computer time)
- Simulated Control System
- Simulated ERFCS/SPDS Computer (e.g., ERF Alarms, Plant Computer Sequence of Events, QSPDS Calculations)
- Handler (e.g., pump, valve, breaker)
- Electrical Bus and Plant Air
- Model Integration (e.g., Reactor Coolant System, Containment, Circulating Water System)
- Plant Fluid System (e.g., Reactor Coolant, Chemical and Volume Control, Auxiliary Feedwater)
- Plant Non-Fluid Systems (e.g., Reactor Core, Main Generator)

- Core Performance (e.g., Rod Worth, Boron Worth)
- Steady State Plant Operation
- Steady State Drift (100%, 80%, 55%, 30%)
- Steady State Accuracy (100%, 80%, 55%, 30%)
- Control Board Lineup Checks (100%, Hot Standby, Cold Shutdown)
- Induced Transients (e.g., Maximum Rate Ramp, Reactor Trip and Recovery)

Each type of Non-Malfunction Test has different objectives and data collection requirements, however all of the Non-Malfunction ATPs (except for the surveillance tests) share the following format broken down by sections: Section 1 contains the text of the Procedure, Section 2 contains References, Section 3 contains Acceptance Criteria. The remainder of the ATP is comprised of applicable Attachments for Remarks and Results.

The Malfunction ATPs include each of the 165 Simulator Malfunctions and 5 multiple malfunctions. Simulator Malfunctions effects range from relatively minor equipment failures (e.g., Load Limiter Potentiometer Malfunction) to Limiting Faults. However, the Malfunctions ATPs characteristically contain similar objectives, variables, and data collection requirements as described below.

The Malfunction ATPs contain up to eleven sections. Section 1, the Malfunction Description, refers the user to the applicable MC&E sheet. Sections 2 and 3 specify the test Initial Conditions (IC), any additional actions needed to set up the test conditions, and the requisite data acquisition points. Section 4 specifies the selection of test malfunction set up variables from among those available as listed on the MC&E Sheet. Sections 5, 6, and 7 describe respectively the Malfunction Effects, Mitigating Actions, and Actions to Recover, in terms of expected actions, applicable instrument and control tag designators, and panel locations of designated instruments and controls. These three sections also provide performance documentation via a sign-off for each applicable expected action. Section 8 lists applicable ATP references. Section 9 provides for Verification of Function and Simulator Response to All Possible Instructor Selections. Section 10 provides ATP Acceptance Criteria, as described in the following subsection. Section 11 lists procedures contained within the ATP.

3.2.1.1 Acceptance Criteria

Acceptance criteria specifically designed to meet or exceed the guidance of Reference were developed for the ATPs. Non-Malfunction ATP acceptance criteria appropriate to ANSI/ANS-3.5-1985, sections 3.1, 3.1.1, 3.2, 3.3, or 4 were specified for each type of test. These criteria are available for review at the Fort Calhoun Site. Malfunction ATPs contained the generic criteria, developed to address the guidance of ANSI/ANS-3.5-1985, Sections 3.1.2, 3.4.2, and 4.2.2. These criteria are as follows:

- The simulation will be within the limits of those plant tests applicable to the scope of simulation as listed in Section 8.0.
- The simulation "critical" parameters as listed in Section 3.0 will demonstrate similarity with "best estimate" Fort Calhoun design calculations or Fort Calhoun data applicable to the scope of simulation as listed in Section 8.0.
- The simulation will cause observable changes in parameters to correspond in time and direction to those from actual plant data or best estimate analysis of the transient, will not violate physical laws of nature, and shall not detract from training.
- The simulator will not fail to cause an alarm or automatic action if the Fort Calhoun Station would have caused an alarm or automatic action, and conversely, the simulator will not cause an alarm or automatic action if the reference plant would not cause an alarm or automatic action.

- If no approved Fort Calhoun Station actual plant data or best estimate analyses are available, comparisons against design calculations will be made and will be judged by PWR operations experienced test engineers against the above criteria.

3.2.2 Malfunction Cause and Effects Sheets

The MC&E Sheets were prepared as a joint effort between Westinghouse and OPPD as part of the Simulator Specification and for instructor use following simulator delivery. These sheets provide the following data for each malfunction:

- 3 to 4 character alphanumeric Identifier;
- Title;
- Description;
- Cause;
- Available selection variables, e.g., component(s) effected, leak size, ramp and delay times, activation mode;
- Plant Response;
- Instructor Notes;
- References.

An example of a MC&E Sheet is included as Figure 3.B.

3.3 TROUBLE REPORT DATA

A computerized database of simulator TRs has been used to document, and track the correction of, problems discovered during simulator construction, testing, and operation. Pursuant to conduct of the ATPs, 2654 TRs were initiated, distributed as follows:

- Hardware 259
- Computer System 1
- Control System 78
- ERFCS/SPDS Computer 36

- Handler 136
- Model Integration 89[illegible]
- Fluid Systems 36
- Non-Fluid Systems 123
- Core Performance 6
- Steady State Operations 102
- Steady State Accuracy 23
- Control Board Lineup 197
- Induced Transients 11
- Malfunctions 677

As of 10/30/90, 2455 of the above TRs had been corrected. The remaining 199 TRs fall into one of four categories -- Active (i.e., no corrective work performed), Returned for Testing (i.e., problem corrected; awaiting testing), In the Field (i.e., corrective work in progress), or Scope (i.e., awaiting determination if problem is within the scope of simulation). An aggressive on-going program has been implemented to correct TRs in a timely fashion. Outstanding ATP TRs are listed on applicable Performance Test Abstracts in Appendix 3.A.

3.4 SIMULATOR PERFORMANCE TEST ABSTRACTS

The Test Abstracts are a synthesis of data extracts from the sources described in Sections 3.2 and 3.3, collated to provide a convenient Certification Submittal presentation medium. Figure 3.A shows the Test Abstract data fields. The mapping of applicable data to the Test Abstracts from the above sources is described below.

Abstract Data Field	Source Document, Section
OPPD Test Number	ATP Test Number
Malfunction Identifier *	ATP, MC&E ID
Test Description	ATP/MC&E Test Title + MC&E Description, or Test Purpose
Initial Conditions	Non-Malfunction ATP Section 1, Malfunction ATP Section 2

Abstract Data Field	Source Document, Section
Options Available *	MC&E Selection Variables
Options Used *	ATP Section 4.1
Test Parameters Monitored	As directed by the Non-Malfunction ATP, or Malfunction ATP Section 3
Test Precis	Synthesis of Non-Malfunction ATP Section 1, or Malfunction ATP Sections 5 - 7
Test Status/Date Completed	ATP OPPD Acceptance Test Procedure Status Report
ANSI/ANS 3.5 Compliance	Based on review of ATP test data
Trouble Report, # / Description	TR Data

* Data applicable to Malfunction Performance Test Abstracts only

3.5 SUMMARY

Appendix 3.A contains 144 Simulator Performance Test Abstracts as a representative sample of the Initial Construction Test Program. The distribution of the 144 is comprised of 58 Non-Malfunction, and 86 Malfunction tests. This sampling represents the requisite tests to demonstrate compliance with the guidance of ANSI/ANS-3.5-1985. The specific selection of the Malfunction Tests for abstraction is congruent with the Malfunctions planned for use during Operator Training in 1990-1991. As the mode of testing changes from Simulator Performance Testing of Reference 1, Section 5.4.1, to Simulator Operability Testing (ANSI/ANS-3.5,1985, Section 5.4.2) additional appropriate malfunctions may be abstracted. Of the 402 ATPs scheduled for eventual completion, 318 have been completed as Category 1, 74 are Category 2, 3 are Category 3, and 7 remain to be started.

3.5 SUMMARY (continued)

Of the 144 tests that are being submitted for the certification submittal, there are 13 tests that remain as Category 2 tests. These are identified in the test abstracts as having a completion date of "future". These tests have all been performed, but many are waiting on the satisfactory completion of one or two TRs by the simulator manufacturer. These tests are planned to be completed by the end of the seven week simulator outage that begins on February 25, 1991.

Appendix B contains the schedule for Performance and Operability Tests.

FIGURE 3.A

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number:

Malfunction:

Test Description:

Initial Conditions:

Options Available:

Options Used:

Test Parameters Monitored:

Test Precis:

Test Status:

Date Completed:

ANSI/ANS 3.5 Compliance:

TR Data:

FIGURE 3.B

MALFUNCTION CAUSE AND EFFECTS SHEET

(THREE PAGES FOLLOWING)

FORT CALHOUN STATION SIMULATOR
MALFUNCTION CAUSE AND EFFECTS

ID: EDS-2
NO: 6.3.4.11.2
REV: 3
DATE: 08/89

Title: 480 VAC Bus Fault

Description: The selected bus(ses) is lost due to a single-phase to ground fault on the bus on phase 2.

Cause: Maintenance; equipment fault.

Instructor Action	Available Selections	Comments
1. Select bus(ses)	A - I	A - Bus 1B3A B - Bus 1B3A-4A C - Bus 1B4A D - Bus 1B3B E - Bus 1B3B-4B F - Bus 1B4B G - Bus 1B3C H - Bus 1B3C-4C I - Bus 1B4C
2. Select delay time	0 - 3600 sec	
3. Select activation mode	D, R, or C	D - Direct R - Remote C - Conditional

Plant Response:

A bus ground alarm will occur. The breaker feeding the selected 480 V bus will trip. Power will be lost to the 480 V loads and MCC's supplied by the faulted bus. The 480 V feeder or tie breaker will indicate tripped on CB-20. The phase voltage indicated on all three phases for the faulted bus will be zero. The phase amps will go high on phase B until the breaker trips (probably will not be seen), then all phase amps indications will go to zero. The undervoltage and breaker trip alarms for the affected bus will occur. If the 480 V bus is supplying an island bus, the island bus breaker will trip. The 480 V motor load breakers will open on undervoltage. The island bus may be transferred to the alternate supply if the fault is on the normal supply.

Title: 480 VAC Bus Fault

Plant Response:

If Bus 1B3A is lost, the following loads will be lost:

MCC 3A4	SI-2A
MCC 3A2	CH-1A
MCC 3A1	VA-3A
MCC3A3	

If Bus 1B3A-4A is lost, the following loads will be lost:

CA-1C	HE-1
SI-2C	

If Bus 1B4A is lost, the following loads will be lost:

AC-3B	MCC 4A2
FW-8B	MCC 4A3
CW-3B	MCC 4A1
SECURITY BLDG	

If Bus 1B3B is lost the following loads will be lost:

CW-3A	MCC 3B2
AC-3A	MCC 3B3
MCC 3B1	

If Bus 1B3B-4B is lost, the following loads will be lost:

FWW-8C	VA-7D
HE-2	CH-1C
SI-3C	

If Bus 1B4B is lost, the following loads will be lost:

SI-3A	MCC4B3
CA-1B	MCC 4B2
MCC 4B1	

Title: 480 VAC Bus Fault

Plant Response: (cont)

If Bus 1C3C is lost, the following loads will be lost:

TIC-3B	CA-1A
MCC 3C2	FW-8A
MCC 3C3	HE-3
MCC 3C1	

If Bus 1B3C-4C is lost, the following loads will be lost:

MCC 3C4C-1	MCC 3C4C-2
VA-7C	AC-3C

If Bus 1B4C is lost, the following loads will be lost:

SI-2B	CH-1B
VA-3B	MCC 4C3
MCC 4C1	MCC 4C4
MCC 4C2	

Instructor Notes:

None.

References:

Fig. 8.1-1 Rev. 27
Electrical Distribution System DBD, 10.3.15, Rev. 0
OPPD Letter D-W-1537N-276

APPENDIX 3.A

COMPUTER REAL TIME TEST

PERFORMANCE TEST ABSTRACT
COMPUTER HARDWARE TEST

Test Number: 14.3.3

Test Name: VERIFICATION OF SPARE COMPUTER TIME

Description: This test verified that the simulator calculations run at a rate of speed sufficient to allow spare duty cycle time.

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: Simulator duty cycle spare time was measured for steady state and severe transient run time conditions. The first segment of this test was to initialize into 100% Power conditions with the Emergency Response Computer operating and with no non-real time tasks active. The test was run for 15 minutes with peak and steady state values for duty cycle spare time collected.

The next tests were multiple malfunctions, and were selected as worst case, expending a maximum of calculation time, thus ensuring any less severe scenario would not exceed spare time limits.

The tests selected were ATP 14.5.5.35.1, LOCA with Loss of Offsite Power, and ATP 14.5.5.35.3, Inadvertent PORV opening with a Loss of Feedwater, and Loss of Offsite Power.

The results of these three tests showed a 25% steady state and 15% transient total available duty cycle spare time per second.

Baseline: FCS Simulator Specification Section 11.04.1 and Simulator Conformed Document Section 11.04.1

Test Status: 1 Date Completed: 4/24/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

APPENDIX 3.A

NORMAL OPERATIONS

AND

STEADY STATE TESTS

INDEX OF NORMAL OPERATIONS AND STEADY STATE TESTS

TEST NO.	TEST NAME	DESCRIPTION
14.5.3.1	Normal operations	Verifies that the simulator is capable of simulating real time plant operations.
14.5.3.2.1	Steady state drift test at 100% power	Verifies that the simulator computed values for 100% power are stable and meet ANSI/ANS-3.5 specifications.
14.5.3.2.2	Steady state drift test at 80% power	Verifies that the simulator computed values for 80% power are stable and meet ANSI/ANS-3.5 specifications.
14.5.3.2.3	Steady state drift test at 55% power	Verifies that the simulator computed values for 55% power are stable and meet ANSI/ANS-3.5 specifications.
14.5.3.2.4	Steady state drift test at 30% power	Verifies that the simulator computed values for 30% power are stable and meet ANSI/ANS-3.5 specifications.
14.5.3.3.1	Steady state accuracy test at 100% power	Verifies simulator computed values and meter indications for 100% power conditions.
14.5.3.3.2	Steady state accuracy test at 80% power	Verifies simulator computed values and meter indications for 80% power conditions.
14.5.3.3.3	Steady state accuracy test at 55% power	Verifies simulator computed values and meter indications for 55% power conditions.
14.5.3.3.4	Steady state accuracy test at 30% power	Verifies simulator computed values and meter indications for 30% power conditions.

PERFORMANCE TEST ABSTRACT
STEADY STATE PLANT OPERATION TEST

Test Number: 14.5.3.1

Test Name: NORMAL OPERATIONS TEST

Description: This test verifies the simulator is capable of simulating real time plant operations of FCS Unit 1

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: This test was performed using Operating Procedures, with Local Operator Actions (LOAs), utilized where appropriate, and non applicable plant specific tasks (Notifications, approvals, manual valve lineups, etc.) annotated as NA.

The test was begun with a normal station shutdown to refueling conditions. Boration rates and amounts were verified to be consistent with plant references and operator experience.

Following Shutdown Cooling (SDC) initiation, a subsequent cooldown and draindown of the Pressurizer was conducted.

Pressurizer refill was conducted and bubble formed. Pressurizer heatup rate and bubble formation were verified to be consistent with operator experience.

A plant heatup to Normal Operating Pressure and Temperature (NOP & NOT) was performed following securing of SDC. Reactor Coolant Pump heat was used and verified to be consistent with plant data, and operator experience.

A dilution to Reactor criticality was performed with dilution rate and amounts were verified to be consistent with Plant references and operator experience. Nuclear Instrumentation response to the dilution and criticality was also verified to be consistent with operator experience.

The Point of Adding Heat response was verified to be consistent with Plant references and operator experience.

PERFORMANCE TEST ABSTRACT
STEADY STATE PLANT OPERATION TEST

Test Number: 14.5.3.1

Test Precis: (cont.)

Turbine Warm-up and Synchronization was performed. The rate of condenser vacuum rise was verified to be consistent with the Vacuum Pump in service.

The Main Turbine warm up and roll was verified to be consistent with Plant references and operator experience.

An increase in Power to 100% was conducted and the Feedwater Pump capacity was verified to be consistent with Plant references and operator experience.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline:

OP-4	Load Changes, Normal Power Operation
OP-5	Plant Shutdown
OI-ST-3	Turbine Generator Shutdown
OP-8	Reactor Shutdown
OP-6	Hot Shutdown to Cold Conditions
OI-RC-4	Reactor Coolant System Normal Shutdown
OI-SC-1	Initiation of Shutdown Cooling
OI-RC-5	Reactor Coolant System Draining
OP-2	Plant Startup from Cold Shutdown to Hot Standby
OI-RC-3	Reactor Coolant System Start-up
OI-SC-2	Termination of Shutdown Cooling
OP-7	Reactor Startup
OP-3	Plant Startup Hot Standby to Minimum Load
OI-ST-2	Turbine Generating Startup
OI-ST-10	Turbine Generator Test
OI-ST-9	Generator Excitation System, Synchronization Procedure

Test Status: 2 Date completed: future

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

Trouble Report, # / Description - CLEARED

PERFORMANCE TEST ABSTRACT
STEADY STATE DRIFT TESTS

Test Number: 14.5.3.2.1

Test Name: STEADY STATE DRIFT TEST AT 100% POWER

Description: This test verified the simulator computed values for 100% Power were stable and met ANSI/ANS-3.5 specifications.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xe

Test Precis: This test was performed by initializing into a 100% Power steady state configuration, with controls in automatic, and acquiring data every three (3) minutes.

Personnel monitored plant parameters at the Instructors control CRT and at the Control Boards.
Following the end of one hour of operation, the test was stopped and the captured data was then examined for deviation.

Simulator Response Assessment: Plant Data

Baseline: Charging Flow, Condenser pressures, inlet and outlet temperatures, Containment narrow and wide range pressures, Heater Drain Cooler inlet temperatures, Feed Pump pressures, Feedwater Heaters pressures and temperatures, Main Feedwater pressure, Main Generator Mwe, Feedwater Heaters outlet temperatures, Hydrogen Cooler outlet temperature, RCS Loops, Delta T, T_{hot}, T_{cold}, T_{avg}, Letdown flow and temperature, Main Steam Header pressure and temperature, Power Range Channels upper and lower detectors, Pressurizer levels, Pressurizer narrow and wide range pressure, Reactor Coolant Loop delta pressures, Reactor Coolant Loop total flows, Steam Generator Blowdown flows and temperatures, Steam Generator Steam flows, Feed flows and temperatures, Steam Generator wide range levels and pressures, RCS boron concentration, Reactor thermal megawatts, Stator Cooler outlet temperature, Steam Packing Exhauster inlet temperature, Main Turbine first stage pressure, VCT level, Wide range Log power levels, Boric Acid tank levels, Core Exit Thermocouple temperature, Quench Tank level, Pzr liquid and steam temperatures.

PERFORMANCE TEST ABSTRACT
STEADY STATE DRIFT TESTS

Test Number: 14.5.3.2.1

Test Status: 1 Date Completed: 12/23/89

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
STEADY STATE DRIFT TESTS

Test Number: 14.5.3.2.2

Test Name: STEADY STATE DRIFT TEST AT 80% POWER

Description: This test verified the simulator computed values for 80% Power were stable and met ANSI/ANS-3.5 specifications.

Initial Conditions:

IC-13 BOC, 80% Power, Equil. Xe

Test Precis: This test was performed by initializing into a 80% Power steady state configuration, with controls in automatic, and acquiring data every three (3) minutes.

Personnel monitored plant parameters at the Instructors control CRT and at the Control Boards.
Following the end of one hour of operation, the test was stopped and the captured data was then examined for deviation.

Simulator Response Assessment: Plant Data

Baseline: Charging Flow, Condenser pressures, inlet and outlet temperatures, Containment narrow and wide range pressures, Heater Drain Cooler inlet temperatures, Feed Pump pressures, Feedwater Heaters pressures and temperatures, Main Feedwater pressure, Main Generator MWe, Feedwater Heaters outlet temperatures, Hydrogen Cooler outlet temperature, RCS Loops, Delta T, T_{hot}, T_{cold}, T_{avg}, Letdown flow and temperature, Main Steam Header pressure and temperature, Power Range Channels upper and lower detectors, Pressurizer levels, Pressurizer narrow and wide range pressure, Reactor Coolant Loop delta pressures, Reactor Coolant Loop total flows, Steam Generator Blowdown flows and temperatures, Steam Generator Steam flows, Feed flows and temperatures, Steam Generator wide range levels and pressures, RCS boron concentration, Reactor thermal megawatts, Stator Cooler outlet temperature, Steam Packing Exhauster inlet temperature, Main Turbine first stage pressure, VCT level, Wide range Log power levels, Boric Acid tank levels, Core

PERFORMANCE TEST ABSTRACT
STEADY STATE DRIFT TESTS

Test Number: 14.5.3.2.2

Baseline: (cont.)

Exit Thermocouple temperature, Pressurizer Quench Tank level, Pressurizer liquid and steam temperatures.

Test Status: 1 Date Completed: 12/28/89

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
STEADY STATE DRIFT TESTS

Test Number: 14.5.3.2.3

Test Name: STEADY STATE DRIFT TEST AT 55% POWER

Description: This test verified the simulator computed values for 55% Power were stable and met ANSI/ANS-3.5 specifications.

Initial Conditions:

IC-12 BOC, 55% Power, Equil. Xe

Test Precis: This test was performed by initializing into a 55% Power steady state configuration, with controls in automatic, and acquiring data every three (3) minutes.

Personnel monitored plant parameters at the Instructors control CRT and at the Control Boards.
Following the end of one hour of operation, the test was stopped and the captured data was then examined for deviation.

Simulator Response Assessment: Plant Data

Baseline: Charging Flow, Condenser pressures, inlet and outlet temperatures, Containment narrow and wide range pressures, Heater Drain Cooler inlet temperatures, Feed Pump pressures, Feedwater Heaters pressures and temperatures, Main Feedwater pressure, Main Generator MWe, Feedwater Heaters outlet temperatures, Hydrogen Cooler outlet temperature, RCS Loops, Delta T, T_{hot}, T_{cold}, T_{avg}, Letdown flow and temperature, Main Steam Header pressure and temperature, Power Range Channels upper and lower detectors, Pressurizer levels, Pressurizer narrow and wide range pressure, Reactor Coolant Loop delta pressures, Reactor Coolant Loop total flows, Steam Generator Blowdown flows and temperatures, Steam Generator Steam flows, Feed flows and temperatures, Steam Generator wide range levels and pressures, RCS boron concentration, Reactor thermal megawatts, Stator Cooler outlet temperature, Steam Packing Exhauster inlet temperature, Main Turbine first stage pressure, VCT level, Wide range Log power levels, Boric Acid tank levels,

PERFORMANCE TEST ABSTRACT
STEADY STATE DRIFT TESTS

Test Number: 14.5.3.2.3

Baseline: (cont.)

Core Exit Thermocouple temperature, Pressurizer Quench Tank level, Pressurizer liquid and steam temperatures.

Test Status: 1 Date Completed: 12/26/89

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
STEADY STATE DRIFT TESTS

Test Number: 14.5.3.2.4

Test Name: STEADY STATE DRIFT TEST AT 30% POWER

Description: This test verified the simulator computed values for 30% Power were stable and met ANSI/ANS-3.5 specifications.

Initial Conditions:

IC-11 BOC, 30% Power, Equil. Xe

Test Precis: This test was performed by initializing into a 30% Power steady state configuration, with controls in automatic, and acquiring data every three (3) minutes.

Personnel monitored plant parameters at the Instructors control CRT and at the Control Boards.
Following the end of one hour of operation, the test was stopped and the captured data was then examined for deviation.

Simulator Response Assessment: Plant Data

Baseline: Charging Flow, Condenser pressures, inlet and outlet temperatures, Containment narrow and wide range pressures, Heater Drain Cooler inlet temperatures, Feed Pump pressures, Feedwater Heaters pressures and temperatures, Main Feedwater pressure, Main Generator MWe, Feedwater Heaters outlet temperatures, Hydrogen Cooler outlet temperature, RCS Loops, Delta T, T_{hot}, T_{cold}, T_{avg}, Letdown flow and temperature, Main Steam Header pressure and temperature, Power Range Channels upper and lower detectors, Pressurizer levels, Pressurizer narrow and wide range pressure, Reactor Coolant Loop delta pressures, Reactor Coolant Loop total flows, Steam Generator Blowdown flows and temperatures, Steam Generator Steam flows, Feed flows and temperatures, Steam Generator wide range levels and pressures, RCS boron concentration, Reactor thermal megawatts, Stator Cooler outlet temperature, Steam Packing Exhauster inlet temperature, Main Turbine first stage pressure, VCT level, Wide range Log power levels, Boric Acid tank levels,

PERFORMANCE TEST ABSTRACT
STEADY STATE DRIFT TESTS

Test Number: 14.5.3.2.4

Baseline: (cont.)

Core Exit Thermocouple temperature, Pressurizer Quench Tank level, Pressurizer liquid and steam temperatures.

Test Status: 1 Date Completed: 12/23/89

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.1

Test Name: STEADY STATE ACCURACY TEST AT 100% POWER

Description: This test verified the simulator computed values and meter indications for 100% Power conditions.

The testing ensured critical and noncritical parameters were accurate, and within tolerance when compared to FCS Unit 1 at full power.

Principal mass and energy balances were performed during this test.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xe

Test Precis: This test was performed by initializing into a 100% Power steady state configuration, with the controls in automatic. Steam Flow was then adjusted to the values given as baseline data. Main Condenser Vacuum, Circulating Water temperature, and power factor were adjusted as required to maintain the baseline value.

The plant was allowed to stabilize, then computer as well as Control Board instrument data collection was performed.

Personnel then performed the following mass and energy balances:

TDB-V.6 Indication of Reactor Power Based on Delta T
TDB-V.7 Reactor Power Based on Steam Flow
ST-CTPC-1 Core Thermal Power Calculation
ST-RLT-3 Reactor Coolant System Leak Rate Calculation

Simulator Response Assessment: Plant Data and Best Estimate

Baseline:

Critical Parameters:

Charging Flow, Condenser pressures, inlet and outlet temperatures, Containment narrow and wide range pressures,

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.1

Critical Parameters: (cont.)

Heater Drain Cooler inlet temperatures, Feed Pump pressures, Feedwater Heaters pressures and temperatures, Main Feedwater pressure, Main Generator MWe, Feedwater Heaters outlet temperatures, Hydrogen Cooler outlet temp,RCS Loops, Delta T, T hot, T cold, T avg, Letdown flow and temperature, Main Steam Header pressure and temperature, Power Range Channels upper and lower detectors, Pressurizer levels, Pressurizer narrow and wide range pressure, Reactor Coolant Loop delta pressures, Reactor Coolant Loop total flows, Steam Generator Blowdown flows and temperatures, Steam Generator Steam flows, Feed flows and temperatures, Steam Generator wide range levels and pressures, RCS boron concentration, RCS flow, Reactor thermal megawatts, Stator Cooler outlet temperature, Steam Packing Exhauster inlet temperature, Main Turbine first stage pressure, VCT level, Wide range Log power levels, Pressurizer liquid and steam temperatures.

Monitored Parameters:

Steam Generator AFW flows, AFW Storage Tank levels, Boric Acid tank levels, Turbine Bearings vibration, CCW Pump discharge flow and temperature, CCW supply temperature, Core Exit Thermocouple temperatures, Charging Header pressure, Containment (CNTMT) ambient temperatures, CNTMT average ambient temperature, CNTMT Cooler outlet air temperatures, CNTMT temperatures, CNTMT H_2 concentrations, CNTMT Spray flows, CNTMT Sump levels, CNTMT water levels, Control Rod positions for group 4, Control Valve Chest in and out metal temperatures, Diesel Generators KW and voltage, Main Turbine differential expansion, Emergency Feedwater Storage Tank temperature, Emergency Busses 1A3 and 1A4 volts, Generator field current and voltage, High CET temperatures by quadrants, Highest Core Exit temperature, High pressure extraction pressures and temperatures to Feed heaters, HPSI flows, Instrument Air pressure, Low pressure extraction pressures and temperatures to Feed heaters, LPSI flows, Main Turbine speed, PORV flows, Pressurizer Quench Tank level, temperature

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.1

Monitored Parameters: (cont.)

and pressure, Reactor Vessel levels, Turbine Rotor expansion, SIT levels and pressures, Safety Injection Refueling Water Tank levels, Steam Seal Header pressure, Steam Separators inlet and outlet pressures, STG shell lower in and out metal temperature, Turbine eccentricity, Turbine Exhaust pressures, Turbine Steam Chest pressure and VCT pressure.

Other Parameters:

An additional 154 other parameters were monitored for balance of plant.

Test Status: 1 Date Completed: 5/19/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.2

Test Name: STEADY STATE ACCURACY TEST AT 80% POWER

Description: This test verified the simulator computed values and meter indications for 80% Power conditions. The testing ensured critical and noncritical parameters were accurate, and within tolerance when compared to FCS Unit 1 at 80% of full power. Principal mass and energy balances were performed during this test.

Initial Conditions:

IC-13 BOC, 80% Power, Equil. Xe

Test Precis: This test was performed by initializing into a 80% Power steady state configuration, with the controls in automatic. Steam Flow was then adjusted to the values given as baseline data. Main Condenser Vacuum, Circulating Water temperature, and power factor were adjusted as required to maintain the baseline value.

The plant was allowed to stabilize, then computer as well as Control Board instrument data collection was performed.

Personnel performed the following mass and energy balances:

TDB-V.6 Indication of Reactor Power Based on Delta T
TDB-V.7 Reactor Power Based on Steam Flow
ST-CTPC-1 Core Thermal Power Calculation
ST-RLT-3 Reactor Coolant System Leak Rate Calculation

Simulator Response Assessment: Plant Data and Best Estimate

Baseline:

Critical Parameters:

Charging Flow, Condenser pressures, inlet and outlet temperatures, Containment narrow and wide range pressures, Heater Drain Cooler inlet temperatures, Feed Pump pressures, Feedwater Heaters pressures and temperatures, Main

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.2

Critical Parameters: (cont.)

Feedwater pressure, Main Generator MWe, Feedwater Heaters outlet temperatures, Hydrogen Cooler outlet temp, RCS Loops, Delta T, T_{hot}, T_{cold}, T_{avg}, Letdown flow and temperature, Main Steam Header pressure and temperature, Power Range Channels upper and lower detectors, Pressurizer levels, Pressurizer narrow and wide range pressure, Reactor Coolant Loop delta pressures, Reactor Coolant Loop total flows, Steam Generator Blowdown flows and temperatures, Steam Generator Steam flows, Feed flows and temperatures, Steam Generator wide range levels and pressures, RCS boron concentration, RCS flow, Reactor thermal megawatts, Stator Cooler outlet temperature, Steam Packing Exhauster inlet temperature, Main Turbine first stage pressure, VCT level, Wide range Log power levels, Pressurizer liquid and steam temperatures.

Monitored Parameters:

Steam Generator AFW flows, AFW Storage Tank levels, Boric Acid tank levels, Turbine Bearings vibration, CCW Pump discharge flow and temperature, CCW supply temperature, Core Exit Thermocouple temperatures, Charging Header pressure, Containment (CNTMT) ambient temperatures, CNTMT average ambient temperature, CNTMT Cooler outlet air temperatures, CNTMT temperatures, CNTMT H_2 concentrations, CNTMT Spray flows, CNTMT Sump levels, CNTMT water levels, Control Rod positions for group 4, Control Valve Chest in and out metal temperatures, Diesel Generators KW and voltage, Main Turbine differential expansion, Emergency Feedwater Storage Tank temperature, Emergency Busses 1A3 and 1A4 volts, Generator field current and voltage, High CET temperatures by quadrants, Highest Core Exit temperature, High pressure extraction pressures and temperatures to Feed heaters, HPSI flows, Instrument Air pressure, Low pressure extraction pressures and temperatures to Feed heaters, LPSI flows, Main Turbine speed, PORV flows, Pzr. Quench Tank level, temperature and pressure, Reactor Vessel levels, Turbine Rotor expansion, SIT levels and pressures, Safety Injection Refueling

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.2

Monitored Parameters: (cont.)

Water Tank levels, Steam Seal Header pressure, Steam Separators inlet and outlet pressures, STG shell lower in and out metal temperature, Turbine eccentricity, Turbine Exhaust pressures, Turbine Steam Chest pressure and VCT pressure.

Other Parameters:

An additional 154 other parameters were monitored for balance of plant.

Test Status: 1 Date Completed: 5/19/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.3

Test Name: STEADY STATE ACCURACY TEST AT 55% POWER

Description: This test verified the simulator computed values and meter indications for 55% Power conditions. The testing ensured critical and noncritical parameters were accurate, and within tolerance when compared to FCS Unit 1 at 55% of full power. Principal mass and energy balances were performed during this test.

Initial Conditions:

IC-12 BOC, 55% Power, Equil. Xe

Test Precis: This test was performed by initializing into a 55% Power steady state configuration, with the controls in automatic. Steam Flow was then adjusted to the values given as baseline data. Main Condenser Vacuum, Circulating Water temperature, and power factor were adjusted as required to maintain the baseline value.

The plant was allowed to stabilize, then computer as well as Control Board instrument data collection was performed.

; onnel performed the following mass and energy balances:

TDB-V.6 Indication of Reactor Power Based on Delta T
TDB-V.7 Reactor Power Based on Steam Flow
ST-CTPC-1 Core Thermal Power Calculation
ST-RLT-3 Reactor Coolant System Leak Rate Calculation

Simulator Response Assessment: Plant Data and Best Estimate

Baseline:

Critical Parameters:

Charging Flow, Condenser pressures, inlet and outlet temperatures, Containment narrow and wide range pressures, Heater Drain Cooler inlet temperatures, Feed Pump pressures, Feedwater Heaters pressures and temperatures,

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.3

Critical Parameters: (cont.)

Main Feedwater pressure, Main Generator MWe, Feedwater Heaters outlet temperatures, Hydrogen Cooler outlet temp, RCS Loops, Delta T, T_{hot}, T_{cold}, T_{avg}, Letdown flow and temperature, Main Steam Header pressure and temperature, Power Range Channels upper and lower detectors, Pressurizer levels, Pressurizer narrow and wide range pressure, Reactor Coolant Loop delta pressures, Reactor Coolant Loop total flows, Steam Generator Blowdown flows and temperatures, Steam Generator Steam flows, Feed flows and temperatures, Steam Generator wide range levels and pressures, RCS boron concentration, RCS flow, Reactor thermal megawatts, Stator Cooler outlet temperature, Steam Packing Exhauster inlet temperature, Main Turbine first stage pressure, VCT level, Wide range Log power levels, Pressurizer liquid and steam temperatures.

Monitored Parameters:

Steam Generator AFW flows, AFW Storage Tank levels, Boric Acid tank levels, Turbine Bearings vibration, CCW Pump discharge flow and temperature, CCW supply temperature, Core Exit Thermocouple temperatures, Charging Header pressure, Containment (CNTMT) ambient temperatures, CNTMT average ambient temperature, CNTMT Cooler outlet air temperatures, CNTMT temperatures, CNTMT H_2 concentrations, CNTMT Spray flows, CNTMT Sump levels, CNTMT water levels, Control Rod positions for group 4, Control Valve Chest in and out metal temperatures, Diesel Generators KW and voltage, Main Turbine differential expansion, Emergency Feedwater Storage Tank temperature, Emergency Busses 1A3 and 1A4 volts, Generator field current and voltage, High CET temperatures by quadrants, Highest Core Exit temperature, High pressure extraction pressures and temperatures to Feed heaters, HPSI flows, Instrument Air pressure, Low pressure extraction pressures and temperatures to Feed heaters, LPSI flows, Main Turbine speed, PORV flows, Pzr. Quench Tank level, temperature and pressure, Reactor Vessel levels, Turbine Rotor expansion, SIT levels and pressures, Safety Injection Refueling

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.3

Monitored Parameters: (cont.)

Water Tank levels, Steam Seal Header pressure, Steam Separators inlet and outlet pressures, STG shell lower in and out metal temperature, Turbine eccentricity, Turbine Exhaust pressures, Turbine Steam Chest pressure and VCT pressure.

Other Parameters:

An additional 154 other parameters were monitored for balance of plant.

Test Status: 1 Date Completed: 5/19/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.4

Test Name: STEADY STATE ACCURACY TEST AT 30% POWER

Description: This test verifies the simulator computed values and meter indications for 30% Power conditions. The testing ensured critical and noncritical parameters were accurate, and within tolerance when compared to FCS Unit 1 at 30% of full power. Principal mass and energy balances were performed during this test.

Initial Conditions:

IC-11 BOC, 30% Power, Equil. Xe

Test Precis: This test was performed by initializing into a 30% Power steady state configuration, with the controls in automatic. Steam Flow was then adjusted to the values given as baseline data. Main Condenser Vacuum, Circulating Water temperature, and power factor were adjusted as required to maintain the baseline value.

The plant was allowed to stabilize, then computer as well as Control Board instrument data collection was performed.

Personnel performed the following mass and energy balances:

TDB-V.6 Indication of Reactor Power Based on Delta T
TDB-V.7 Reactor Power Based on Steam Flow
ST-CTPC-1 Core Thermal Power Calculation
ST-RLT-3 Reactor Coolant System Leak Rate Calculation

Simulator Response Assessment: Plant Data and Best Estimate
Baseline:

Critical Parameters:

Charging Flow, Condenser pressures, inlet and outlet temperatures, Containment narrow and wide range pressures, Heater Drain Cooler inlet temperatures, Feed Pump pressures, Feedwater Heaters pressures and temperatures,

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.4

Critical Parameters: (cont.)

Main Feedwater pressure, Main Generator MWe, Feedwater Heaters outlet temperatures, Hydrogen Cooler outlet temp, RCS Loops, Delta T, T_{hot}, T_{cold}, T_{avg}, Letdown flow and temperature, Main Steam Header pressure and temperature, Power Range Channels upper and lower detectors, Pressurizer levels, Pressurizer narrow and wide range pressure, Reactor Coolant Loop delta pressures, Reactor Coolant Loop total flows, Steam Generator Blowdown flows and temperatures, Steam Generator Steam flows, Feed flows and temperatures, Steam Generator wide range levels and pressures, RCS boron concentration, RCS flow, Reactor thermal megawatts, Stator Cooler outlet temperature, Steam Packing Exhauster inlet temperature, Main Turbine first stage pressure, VCT level, Wide range Log power levels, Pressurizer liquid and steam temperatures.

Monitored Parameters:

Steam Generator AFW flows, AFW Storage Tank levels, Boric Acid tank levels, Turbine Bearings vibration, CCW Pump discharge flow and temperature, CCW supply temperature, Core Exit Thermocouple temperatures, Charging Header pressure, Containment (CNTMT) ambient temperatures, CNTMT average ambient temperature, CNTMT Cooler outlet air temperatures, CNTMT temperatures, CNTMT H_2 concentrations, CNTMT Spray flows, CNTMT Sump levels, CNTMT water levels, Control Rod positions for group 4, Control Valve Chest in and out metal temperatures, Diesel Generators KW and voltage, Main Turbine differential expansion, Emergency Feedwater Storage Tank temperature, Emergency Busses 1A3 and 1A4 volts, Generator field current and voltage, High CET temperatures by quadrants, Highest Core Exit temperature, High pressure extraction pressures and temperatures to Feed heaters, HPSI flows, Instrument Air pressure, Low pressure extraction pressures and temperatures to Feed heaters, LPSI flows, Main Turbine speed, PORV flows, Pzr. Quench Tank level, temperature and pressure, Reactor Vessel levels, Turbine Rotor expansion, SIT levels and pressures, Safety Injection Refueling

PERFORMANCE TEST ABSTRACT
STEADY STATE ACCURACY TESTS

Test Number: 14.5.3.3.4

Monitored Parameters: (cont.)

Water Tank levels, Steam Seal Header pressure, Steam Separators inlet and outlet pressures, STG shell lower in and out metal temperature, Turbine eccentricity, Turbine Exhaust pressures, Turbine Steam Chest pressure and VCT pressure.

Other Parameters:

An additional 154 other parameters were monitored for balance of plant.

Test Status: 1 Date Completed: 5/19/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

APPENDIX 3.A

TRANSIENT TESTS

INDEX OF TRANSIENT TESTS

TEST NO.	TEST NAME	DESCRIPTION
14.5.4.1	Maximum rate power ramp	Verifies the ability of the simulator to respond to a maximum rate downpower.
14.5.4.2	Main turbine stop and control valve	Verifies the ability of the simulator to respond to main turbine stop, intermediate stop, and control valve testing.
14.5.4.3	Inadvertent boration/dilution	Verifies the ability of the simulator to respond to a dilution and boration event at full power.
14.5.4.4	Reactor trip and recovery	Verifies the ability of the simulator to perform a reactor trip and subsequent restart.
14.5.4.5	Dropped rod test	Verifies the ability of the simulator to respond to a single dropped CEA.
14.5.4.6	Manual reactor trip	Verifies the ability of the simulator to produce and conform to a baseline manual reactor trip.
14.5.4.7	Simultaneous trip of main feedwater pumps	Verifies the ability of the simulator to produce and conform to a baseline simultaneous trip of all feedwater pumps.
14.5.4.8	Simultaneous closure of main steam isolation valves	Verifies ability of the simulator to produce and conform to a baseline simultaneous closure of MSIVs.
14.5.4.9	Simultaneous trip of all RCPs	Verifies the ability of the simulator to produce and conform to a baseline simultaneous trip of all RCPs.
14.5.4.10	Trip any RCP	Verifies the ability of the simulator to produce and conform to a baseline trip of any single reactor coolant pump.
14.5.4.11	Loss of load	Verifies the ability of the simulator to produce and conform to a baseline main turbine trip.
14.5.4.12	Maximum rate power ramp	Verifies the ability of the simulator to produce and conform to a baseline maximum rate power ramp.
14.5.4.13	LOCA with loss of all offsite power	Verifies the ability of the simulator to produce and conform to a baseline maximum size RCS rupture combined with a loss of all offsite power.

INDEX OF TRANSIENT TESTS

TEST NO.	TEST NAME	DESCRIPTION
14.5.4.14	Excess steam demand	Verifies the ability of the simulator to produce and conform to a baseline maximum size unisolable main steam line rupture.
14.5.4.15	Slow RCS depressurization to saturation, no HPSI	Verifies the ability of the simulator to produce and conform to a baseline slow primary system depressurization to saturated condition using pressurizer relief valve stuck open with activation of high pressure ECCS inhibited.

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.1

Test Name: MAXIMUM RATE POWER RAMP

Description: This test verified the ability of the simulator to respond to a maximum rate downpower in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% Power conditions, with the following systems in automatic:

Pressurizer Level Control
Pressurizer Pressure Control
Letdown Temperature Control
Volume Control Tank Inlet Control
Steam Generator Level Controls
Steam Dump and Bypass System Control

Data collection was initiated, then in accordance with AOP-5, a rapid load drop to 20% Power was performed at a 10% per minute ramp. Manual control of Control Rods, Letdown pressure and Main Turbine Control were the only manipulations performed.

Testing resulted in the Reactor still critical, with no Safety Valves lifted, and in 10 minutes plant parameter trends were stabilizing.

Simulator Response Assessment: Best Estimate

Test Status: 1 Date Completed: 5/19/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.2

Test Name: MAIN TURBINE STOP AND CONTROL VALVE TEST

Description: This test verified the ability of the simulator to respond to Main Turbine Stop, Intermediate and Control Valve testing in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% Power conditions, with the following systems in automatic:

- Pressurizer Level Control
- Pressurizer Pressure Control
- Letdown Temperature Control
- Volume Control Tank Inlet Control
- Steam Generator Level Controls
- Steam Dump and Bypass System Control

Data collection was initiated, then in accordance with OI-ST-10-A, testing of the Main Turbine steam inlet valves was performed. With Generator loading allowed to swing, the Stop Valve was timed and shut, then the valve was reopened. All 4 Stops were tested in the same fashion.

Data collection was again initiated, then in accordance with OI-ST-10-A, testing of the Main Turbine Intermediate Valves was performed. With Generator loading allowed to swing, the Intermediate Valve was timed and shut, then the valve was reopened. All 4 Intermediate Valves were tested in the same fashion.

Data collection was again initiated, then in accordance with OI-ST-10-A, testing of the Main Turbine Control valve was performed. With Generator loading allowed to swing, the Control Valve was timed and shut, then the valve was reopened.

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.2

Test Precis: (cont.)

Testing continued with data collection, and then in accordance with OI-ST-10-A, tests of the Main Turbine Stop Valves SV-1 thru 4 and Intermediate Valves IV-1 thru 4 was performed. With Generator loading allowed to swing, the Valves were timed and shut, then the valves were reopened.

Testing showed the integrated plant response to be realistic, self dampening and that Station procedures could be used.

Response Assessment: Plant Data and Best Estimate

Baseline: OPPD Plant Data, Letter D-W-1537N-260, April 7,1989
OI-ST-10, Turbine Generator Tests

Test Status: 1 Date Completed: in review

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.3

Test Name: INADVERTENT BORATION/DILUTION TEST

Description: This test verified the ability of the simulator to respond to a dilution and boration event at full power in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into a 100% Power configuration, with the following systems in conditions:

CEAs at All Rods Out
Pressurizer Level Control in Auto
Pressurizer Pressure Control in Auto
CVCS in normal operation
Steam Generator Level Controls in Auto
Steam Dump and Bypass System Control

Data collection was initiated, then a continuous dilution was initiated by aligning demineralized water to the Charging Pump suctions and starting an additional 2 Charging Pumps.

A Reactor trip on Thermal Margin/Low Pressure (TM/LP) or Variable High Power Trip was verified to occur then the dilution was secured and the plant allowed to stabilize.

The test continued following reinitialization to 100% power, and the initiation of data collection. A continuous boration was initiated by starting both Boration pumps, aligning the discharge to the Charging Pump suctions and starting an additional 2 Charging Pumps.

A Reactor trip on Thermal Margin/Low Pressure (TM/LP) was verified to occur then the boration was secured and the plant was allowed to stabilize.

Testing showed the plant response to be realistic.

Simulator Response Assessment: Best Estimate

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.3

Baseline: U.S.A.R. Section 14.3

Test Status: 1 Date Completed: 4/10/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.4

Test Name: REACTOR TRIP AND RECOVERY TEST

Description: This test verified the ability of the simulator to perform a Reactor trip and subsequent restart in a realistic fashion.

Initial Conditions:

IC-13 BOC, 80% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 80% of full rated power conditions, with the following systems in automatic:

- Pressurizer Level Control
- Pressurizer Pressure Control
- Letdown Temperature Control
- Volume Control Tank Inlet Control
- Steam Generator Level Controls
- Steam Dump and Bypass System Control

Data collection was begun, and the Reactor trip Pushbutton was depressed, initiating the transient. Operator control manipulations were performed to model as closely as possible the FCS trip transient data being used. Following plant stabilization, simulator data and FCS trip data were compared.

Using Operating Procedures OP-1, 3 & 7, the Reactor was started up and returned to 100% Full Power conditions.

Simulator Response Assessment: Plant data and Best Estimate

Baseline: Fort Calhoun Reactor Trip Logbook 9/19/80, OP-1, Master Checklist for Start-up or Trip Recovery, OP-3, Plant Start-up from Hot Standby to Minimum Load, and OP-7, Reactor Start-up.

Test Status: 1 Date Completed: 3/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.5

Test Name: DROPPED ROD TEST

Description: This test verified the ability of the simulator to respond to a single dropped CEA in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% full rated power conditions, with the following systems in automatic:

Pressurizer Level Control
Pressurizer Pressure Control
Letdown Temperature Control
Volume Control Tank Inlet Control
Steam Generator Level Controls
Steam Dump and Bypass System Control

Data collection was initiated, and CEA 40 was dropped to 0" withdrawn. Changes such as lowered NI readings in the affected quadrant, Core power shift, with lowered RCS temperatures and Pressurizer parameters were verified to occur.

Following plant stabilization, data analysis showed the plant response to be realistic.

Simulator Response Assessment: Best Estimate

Baseline: CEA Drop Accident Sheet B, 7-15-15

Test Status: 1 Date Completed: 3/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.6

Test Name: MANUAL REACTOR TRIP TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline manual Reactor trip in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% power conditions, with systems verified to be in normal full power configuration. A five minute stability check was performed. Data collection was begun and the Reactor Trip Pushbutton was depressed, initiating the transient.

Other than manual letdown pressure control, no Operator control manipulations were performed. Hot Standby conditions were verified maintained in automatic, and following trend stabilization, testing was concluded. Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Plant data and Best Estimate

Baseline: Fort Calhoun Reactor Trip Logbook 9/19/80

Test Status: 1 Date Completed: 12/31/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.7

Test Name: SIMULTANEOUS TRIP OF MAIN FEEDWATER PUMPS TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline simultaneous trip of all feedwater pumps in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% power conditions, with systems verified to be in normal full power configuration. A five minute stability check was performed. Data collection was begun, and the Main Feedwater Pumps were tripped simultaneously, initiating the transient.

Other than manual letdown pressure control, no Operator control manipulations were performed. Uncomplicated Reactor Trip Criteria were verified maintained in automatic, and following trend stabilization, testing was concluded. Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Best Estimate

Baseline: Updated Safety Analysis Report

Test Status: 1 Date Completed: 12/31/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.8

Test Name: SIMULTANEOUS CLOSURE OF MAIN STEAM ISOLATION VALVES TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline simultaneous closure of Main Steam Isolation Valves in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% power conditions, with systems verified to be in normal full power configuration. A five minute stability check was performed. Data collection was begun, and the MSIVs were manually shut simultaneously, initiating the transient.

Other than manual Letdown pressure control, no Operator control manipulations were performed. Uncomplicated Reactor Trip Criteria were verified maintained in automatic, and following trend stabilization, testing was concluded. Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Best Estimate

Baseline: Updated Safety Analysis Report

Test Status: 1 Date Completed: 12/28/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.9

Test Name: SIMULTANEOUS TRIP OF ALL RCPs TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline simultaneous trip of all Reactor Coolant Pumps in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% power conditions, with systems verified to be in normal full power configuration. A five minute stability check was performed. Data collection was begun, and using a malfunction, the RCPs were tripped simultaneously, initiating the transient.

Other than manual Letdown pressure control, no Operator control manipulations were performed. Uncomplicated Reactor Trip Criteria were verified maintained in automatic, and following trend stabilization, testing was concluded. Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Best Estimate

Baseline: Updated Safety Analysis Report

Test Status: 1 Date Completed: 12/31/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.10

Test Name: TRIP ANY RCP TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline trip of any single Reactor Coolant Pump in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% power conditions, with systems verified to be in normal full power configuration. A five minute stability check was performed. Data collection was begun, and one RCP was tripped initiating the transient.

Other than manual Letdown pressure control, no Operator control manipulations were performed. Uncomplicated Reactor Trip Criteria was verified maintained in automatic, and following trend stabilization, testing was concluded. Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Best Estimate

Baseline: Updated Safety Analysis Report

Test Status: 1 Date Completed: 12/28/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.11

Test Name: LOSS OF LOAD TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline Main Turbine Trip in a realistic fashion.

Initial Conditions:

IC-12 BOC, 55% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 55% power conditions, with systems verified to be in a normal configuration. A five minute stability check was performed. Data collection was begun, and the Main Turbine was manually tripped, initiating the transient.

Other than manual Letdown pressure control, no Operator control manipulations were performed. Uncomplicated Reactor Trip Criteria was verified maintained in automatic, and following trend stabilization, testing was concluded. Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Plant data and Best Estimate

Baseline: Plant Outage Report 76-4, May 28, 1976

Test Status: 1 Date Completed: 12/28/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? YES

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.11

Test Name: LOSS OF LOAD TEST

ANSI/ANS 3.5 Test Exception:

TRANSIENT TEST (APPENDIX B) B.2.2(6) TEST EXCEPTION

An exception to ANSI/ANS 3.5 is taken for this test, due to FCS Unit 1 plant configuration and operation.

FCS System Design criteria stipulate the automatic actuation of a Turbine Trip-Unit Trip Interlock at 15% power. Station procedures require main generator synchronization at 12% power. Block Load is then applied to avoid a Generator Reverse Power Trip. Block Loading and its subsequent Feedwater Heater Extraction Steam Load, combine to raise power to above the level at which Loss of Load is bypassed.

Therefore, for the FCS simulator, testing for Main Turbine Trip (maximum power level which does not result in an immediate reactor trip) is not performed, as there is no power level at which this test is applicable.

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.12

Test Name: MAXIMUM RATE POWER RAMP TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline maximum rate power ramp in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: To minimize operator intervention, and optimize repeatability, this test was performed in the following fashion. The reactivity change between Full and 75% Power was determined, then testing was begun by initializing into 100% Power conditions, normal Full Power configuration. A five minute stability check was performed, and data collection was begun.

Using a boration malfunction with a 300 second ramp, the determined negative reactivity was inserted, while maintaining the RCS temperature program by lowering Turbine load to 75% Power.

Following a 5 minute stabilization and parameters check, power was rapidly returned to 100% Power using the reverse of the above procedure.

Operator control manipulations were performed. Normal Full Power conditions were verified, and following trend stabilization, testing was concluded. Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Best Estimate

Baseline: Updated Safety Analysis Report

Test Status: 1 Date Completed: 1/16/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.13

Test Name: LOCA WITH LOSS OF ALL OFFSITE POWER TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline maximum size RCS rupture combined with a loss of all offsite power in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% power conditions, with systems verified to be in normal full power configuration. A five minute stability check was performed. Data collection was begun, and the simulator set to simultaneously insert a maximum size LOCA with a concurrent total Loss of Offsite Power.

No Operator control manipulations were performed. Safety Functions Status checks were verified, and following stabilization, testing was concluded. The Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Best Estimate

Baseline: Updated Safety Analysis Report

Test Status: 1 Date Completed: 12/28/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.14

Test Name: EXCESS STEAM DEMAND TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline maximum size unisolable Main Steam Line Rupture in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% power conditions, with systems verified to be in normal full power configuration. A five minute stability check was performed. Data collection was begun, and the simulator set to insert a maximum sized unisolable Steam Line Rupture.

No Operator control manipulations were performed. Safety Functions Status check was verified satisfied, and following trend stabilization, testing was concluded. The Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Best Estimate

Baseline: Updated Safety Analysis Report

Test Status: 1 Date Completed: 12/31/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INDUCED TRANSIENT TESTS

Test Number: 14.5.4.15

Test Name: SLOW RCS DEPRESSURIZATION TO SATURATION, NO HPSI TEST

Description: This test verified the ability of the simulator to produce and conform to a baseline slow primary system depressurization to saturated condition using pressurizer relief valve stuck open with activation of high pressure ECCS inhibited, in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by initializing into 100% power conditions, with systems verified to be in normal full power configuration. A five minute stability check was performed. All High Pressure Safety Injection and non-running Charging Pumps were disabled, and data collection was begun.

The transient was initiated by inserting a 50% open PORV malfunction. As RCS pressure slowly lowered, Reactor Coolant Pumps were tripped in accordance with Plant procedures, the running Charging Pump was secured and no other Operator control manipulations were performed.

Safety Functions Status check was verified challenged, and following trend stabilization, testing was concluded. The Simulator data was then analyzed to meet the acceptance criteria.

Simulator Response Assessment: Best Estimate

Baseline: Best Estimate

Test Status: 1 Date Completed: 1/16/90

1 = Satisfactory; 2 = More Testing Required: 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

APPENDIX 3.A

MALFUNCTION TESTS

INDEX OF MALFUNCTION TESTS

TEST NO.	MALFUNCTION ID	DESCRIPTION
14.5.5.1.4	AFW4	Emergency feedwater storage tank leak.
14.5.5.1.5	AFW5	Auxiliary feedwater actuation relay failure.
14.5.5.2.2	CAS2	Service air system leak.
14.5.5.2.3	CAS3	Instrument air loop leak.
14.5.5.2.4	CAS4	Instrument air riser leak.
14.5.5.3.4	CCW4	CCW pump discharge header leak.
14.5.5.3.5	CCW5	CCW heat exchanger leak.
14.5.5.4.1	CND1	Loss of main condenser vacuum.
14.5.5.4.4	CND4	Condensate pump bearing failure.
14.5.5.4.5	CND5	Condensate cooler tube leak.
14.5.5.4.8	CND8	Hotwell level control failure.
14.5.5.6.3	CRD3	Failure of individual rod raise relay.
14.5.5.6.4	CRD4	Failure of individual rod lower relay.
14.5.5.6.5	CRD5	Stuck rod.
14.5.5.6.6	CRD6	Rod clutch failure.
14.5.5.6.7	CRD7	Failure of clutch power supply.
14.5.5.6.8	CRD8	Rod ejection.
14.5.5.7.9	CVC9	Charging line leak outside containment.
14.5.5.8.2	CWS2	Main condenser tube leak.
14.5.5.9.2	DSG2	Diesel generator fuel transfer pumps discharge leak.
14.5.5.9.8	DSG8	Diesel generator failure to start.
14.5.5.11.1	EDS1	4160 VAC bus fault.
14.5.5.11.2	EDS2	480 VAC bus fault.
14.5.5.11.3	EDS3	125 VDC bus fault.
14.5.5.11.4	EDS4	120 VAC instrument bus fault.
14.5.5.11.6	EDS6	480 VAC supply transformer fault.
14.5.5.11.11	EDS11	Switchyard line fault.
14.5.5.11.12	EDS12	Switchyard breaker failure.
14.5.5.12.1	EHC1	WH fluid system leak.
14.5.5.12.6	EHC6	Load limit potentiometer failure.
14.5.5.13.1	ESF1	Steam generator low pressure logic matrix failure.
14.5.5.13.2	ESF2	Containment high pressure logic matrix failure.
14.5.5.13.5	ESF5	Pressurizer low pressure logic matrix failure.
14.5.5.13.10	ESF10	Open safety injection valves actuation failure.
14.5.5.13.12	ESF12	Offsite power low voltage signal logic matrix failure.
14.5.5.14.2	FDW2	Main feedwater header leak.

INDEX OF MALFUNCTION TESTS

TEST NO.	MALFUNCTION ID	DESCRIPTION
14.5.5.14.3	FDW3	Main feedline break upstream of FCV.
14.5.5.14.5	FDW5	Main feedline break inside containment.
14.5.5.16.1	FWH1	Feedwater heater tube leak.
14.5.5.17.1	GEN1	Voltage regulator failure.
14.5.5.17.4	GEN4	Field breaker failure.
14.5.5.18.1	MSS1	Main steam line break inside containment.
14.5.5.18.3	MSS3	Main steam line break outside containment (non-isolable).
14.5.5.18.5	MSS5	Main steam isolation valve failure.
14.5.5.18.6	MSS6	Main steam line to TDAFW pump leak.
14.5.5.18.7	MSS7	Main steam header leak.
14.5.5.19.2	NIS2	Wide range power supply failure.
14.5.5.19.7	NIS7	Power range power supply failure.
14.5.5.20.4	PRS4	Pressurizer steam space leak.
14.5.5.20.5	PRS5	Pressurizer PORV failure.
14.5.5.20.9	PRS9	Pressurizer level instrumentation tap leak.
14.5.5.21.1	RCP1	Reactor coolant pump lube oil cooler leak.
14.5.5.21.3	RCP3	Reactor coolant pump bearing failure.
14.5.5.21.9	RCP9	Reactor coolant pump lower seal failure.
14.5.5.22.1	RCS1	Reactor coolant system loop leak.
14.5.5.22.3	RCS3	Reactor fuel rods failure.
14.5.5.24.1	RPS1	Failure of interposing relay.
14.5.5.24.2	RPS2	Reactor protection system power supply failure.
14.5.5.24.3	RPS3	Failure of axial power distribution positive limit calculator.
14.5.5.25.7	RRS7	Steam dump quick opening solenoid valve failure.
14.5.5.26.3	RWS3	Raw water supply line break.
14.5.5.27.2	SDC2	Shutdown cooling heat exchanger inlet header leak.
14.5.5.30.1	SGN1	Steam generator tube rupture.
14.5.5.30.2	SGN2	Reference leg leak on steam generator level instrumentation.
14.5.5.31.5	SIS5	Safety injection tank gas space leak.
14.5.5.32.3	GEN6	Stator cooling water pump suction line leak.
14.5.5.33.1	TUR1	Main turbine lube oil reservoir leak.

INDEX OF MALFUNCTION TESTS

TEST NO.	MALFUNCTION ID	DESCRIPTION
14.5.5.33.5	TUR5	Main turbine bearing high vibration.
14.5.5.33.6	TUR6	Main turbine turning gear failure.
14.5.5.34.2	WDS2	Gas decay tank leak.
14.5.5.35.1	MM1	LOCA with LOSP and one EDG failure.
14.5.5.35.2	MM2	Inadvertent PORV opening with LOSP and one EDG failure.
14.5.5.35.3	MM3	Inadvertent PORV opening, LOFW (all), LOSP, Loss of SI/ECCS
14.5.5.35.4	MM4	LOFW (all), LOSP, failure of one HPSI pump and one ECCS train.
14.5.5.35.5	MM5	LOCA with 1 S/G isolated, LOSP, 1 EDG failure.

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

<u>OPPD Test Number:</u> 14.5.5.1.4 <u>Malfunction Identifier:</u> AFW4

<u>Test Description:</u> Emergency Feedwater Storage Tank Leak. A variable size leak occurs on the discharge line upstream of FW-339.

<u>Initial Conditions:</u> 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = 8" line	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

<u>Test Parameters Monitored:</u>

T:L1183 AFW TANK LEVEL

<u>Test Precis:</u>

Following malfunction actuation, observe: AFW storage tank level decreases continuously; LCV-1173 opens to fill tank; LCV-1190 opens to make up to condenser from CST; CST level low, AFW Tank Hi-Lo, AFW Tank Lo, Emergency FW Storage Tank Lo-Lo alarms annunciate; LCV-1189 opens to fill AFW tank from demin water; Waste Disposal System Malfunction alarm; Spent Regenerant Tank overflows.
Operator starts demin water pumps and secures makeup to the AFW Storage Tank, then verifies sump level returns to normal after tank empties. Plant is recovered when the operator re-fills the CST, secures demin water pumps, and observes CST Level and Waste Disposal System Trouble alarms clear, and Spent Regenerant Tank level returns to normal.

<u>Test Status:</u> 1 <u>Date Completed:</u> 2/01/90
<u>1</u> = Satisfactory; <u>2</u> = More Testing Required; <u>3</u> = Unsatisfactory

<u>ANSI/ANS 3.5 Compliance:</u>

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Nu-ber: 14.5.5.1.5 Malfunction Identifier: AFW5

Test Description: Auxiliary Feedwater Actuation Relay Failure. The selected relay(s) fail to the selected position.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-H		Selection	A
Magnitude	D OR E	100% = DENRGZD, ENRGZD	Magnitude	E
Ramp Time	N/A		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

1. Following malfunction actuation, observe RC-2A CH A actuation relay light on, AFWS S/G RC-2A CH A actuated, HC-1107A & B and YCV-1045, -1045A all open, FW-6 and FW-10 start, and AFW flow to S/G A.

2. Operator override/stops actuated components. Verify override alarms annunciate and that components respond properly. Verify cessation of AFW flow to S/G A.

3. Plant is recovered when operator clears malfunc[illegible] and observes relay actuation light is off and AFWS actuated [illegible]m clears. Then operator restores AFWS to normal and observes override alarms clear. System is restored per OI-AFW-2.

Test Status: 1 Date Completed: 7/01/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.2.2 Malfunction Identifier: CAS2

Test Description: Service Air System Leak. A variable size leak occurs on the selected Service Air line(s).

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B, C		Selection	A
Magnitude	0-100%	100% = N/A	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	D

Direct/Remote/Conditional

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: plant air pressure drop, standby compressor starts, air pressure low and low-low alarms actuate, at 80 psig PCV-1753 closes, instrument air pressure stabilizes; service air pressure fluctuates with PCV-1753. Operator isolates leak by closing valve CA-629, then verifies that pressure at PI-1700 stabilizes.

Test Status: 1 Date Completed: 2/14/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exceptions to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.2.3 Malfunction Identifier: CAS3

Test Descript' r: Instrument Air Loop Leak. A variable size leak occurs on the selected Instrument Air loop(s).

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B, C		Selection	B
Magnitude	0-100%	100% = 2" BREAK	Magnitude	100
Ramp .	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: plant air pressure decrease, standby compressor starts, air pressure low and low-low alarms actuate, service air stabilizes after automatic isolation, all air operated valves fail as per procedure attachments.
Operator starts 3rd air compressor, isolates leak by closing valve PCV-1849. Then plant air pressure and air operated valves outside containment return to normal. Valves inside containment remain in fail-safe positions.
Plant is restored when air pressure returns to normal and alarms clear, then operator returns compressor lineup to normal.

Test Status: 1 Date Completed: 9/12/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 1?.5.5.2.4 Malfunction Identifier: CAS4

Test Description: Instrument Air Riser Leak. A variable size leak occurs on the selected Instrument Air riser(s).

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-J		Selection	A
Magnitude	0-100%	100% = GUILLOTIN E	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

PCAS1700 Instrument Air Pressure Header Pressure

Test Precis:

Following malfunction actuation, observe: plant air pressure decreases; standby air compressor starts; air pressure low alarm annunciates; waste gas header, RC drain tank, AC to Det wells C/RS OTBD, SG blowdown and OTBD, SIRWT/LKAGE Header SW, mechanical penetration area Exh Sel Sw, SI CHK Valve leakage, HPSI cooler suction , and HCV-800B green lamps lit, HPSI cooler suction SW red lamp lit.
Operator follows AOP-17 and isolates leak by closing IA-532, then verifies the following: instrument air pressure returns to normal, low pressure alarm cl..s, valves listed above return to normal positions.
Plant is restored w.. operator returns compressor lineup to normal and air pressure returns to normal.

Test Status: 1 Date Completed: 5/16/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.3.4   Malfunction Identifier: CCW4

Test Description: CCW Pump Discharge Header Leak. A variable size leak occurs at the tee to containment.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = 16" BREAK	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

BCCW2801	CCW Surge Tank Level
BWDSSPT	Spent Regen Tank Level
PCCW499	CCW Pump Disch Header Pressure
TCCW458	RCP-A Seal Cooler Outlet Temp
TCCW459	RCP-B Seal Cooler Outlet Temp
TCCW460	RCP-C Seal Cooler Outlet Temp
TCCW461	RCP-D Seal Cooler Outlet Temp
TCCW462	RCP-A Lube Oil Cooler Outlet Temp
TCCW463	RCP-B Lube Oil Cooler Outlet Temp
TCCW464	RCP-C Lube Oil Cooler Outlet Temp
TCCW465	RCP-D Lube Oil Cooler Outlet Temp
TLDS211	HX CH-7 Outlet Temp
WCCW498	CCW Pump Discharge Flow

Test Precis:

Following malfunction actuation, observe: CCW flow rises, pressure and surge tank level decrease, low level alarm, at approximately 42" LCV-2801 opens; flow decreases to seal oil, lube oil, CEDM coolers, Letdown heat exchanger, detector well cooling coil VA-14A & B,, containment cooling VA-1A & B, -8A & B, attendant listed alarms annunciate; temperatures rise on cooled components with attendant listed alarms; leakage flows to the spent regenerative tank via floor drains, Waste Disposal System Malfunction alarm annunciates; CCW pumps cavitate, letdown flow diverts; excore detectors read erroneously due to high temperature; containment dew point rises. Operator follows AOP-11 and provides Raw Water to components.

Test Status: 1 Date Completed: 5/10/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.3.5 Malfunction Identifier: CCW5

Test Description: CCW Heat Exchanger Tube Leak. Tube failure occurs to a selectable degree in the selected heat exchanger.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-D		Selection	A
Magnitude	0-100%	100% = 10% TUBE FAILURE	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

BCCW2801 CCW Surge Tank Level
WCCW498 CCW Pump Discharge Flow

Test Precis:

Following malfunction actuation, observe: leakage from CCW into the Raw Water System with attendant indications of a CCW leak (see CCW4). When CCW pumps cavitate and raw water flows into CCW, observe increased raw water flow, and increasing CCW surge tank level with attendant alarm. Operator isolates faulted heat exchanger and verifies CCW system returns to normal.
Plant is recovered by automatic action of vacuum deaerator, combined with operator action to maintain level in the primary water storage tank and demineralized water surge tank.

Test Status: 1 Date Completed: 3/29/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.4.1 Malfunction Identifier: CND1

Test Description: Loss Of Main Condenser Vacuum. Air leakage into the condenser causes pressure to rise.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = VAC BKR OPEN	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

FNISWRM	Wide Range Detector Output
SGEN1R	Generator MWAH's meter
T:P975A	Condenser A Vacuum
T:P975B	Condenser B Vacuum
T:T974A	Condenser A Exhaust Neck Temp
T:T974F	Condenser B Exhaust Neck Temp

Test Precis:

Following malfunction actuation, observe: condenser A vacuum decreases faster than condenser B vacuum; standby vacuum pump starts with attendant alarm annunciation; exhaust high pressure alarms annunciate; exhaust hood temperature rises, generator output decreases, Rx trips at approximately 3 minutes after malfunction actuation. Operator follows EOP-01.

Test Status: 1 Date Completed: 1/23/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.4.4 Malfunction Identifier: CND4

Test Description: Condensate Pump Bearing Failure. The selected condensate pump(s) experiences bearing failure.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B, C		Selection	A
Magnitude	0-100%	100% = N/A	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

T:P1181A Cond Pump A Disch Press
YFWPFW2A Condensate Pump FW-2A Amps

Test Precis:

Following malfunction actuation, observe: condensate pump A amps rise sharply, then decrease to 0 after pump seizes; pump trips with attendant overload trip alarm; discharge pressure decreases to 0; standby condensate pump starts normally.
Plant is recovered when operator clears malfunction, verifies normal alarm responses, returns condensate pump A to service and stops condensate pump B, and all flows and pressures are normal.

Test Status: 1 Date Completed: 4/18/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.4.5 Malfunction Identifier: CND5

Test Description: Condensate Cooler Tube Leak. Tube failure occurs to a selectable degree in the condensate cooler.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100	100% = 10% TUBE FAILURE	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

T:L1170A	Condenser Hotwell Level
T:L1191	CST Level
T:T1177	Condensate Cooler Outlet Header Temp.
T:T1178A	Stator Cooler Inlet Temp.

Test Precis:

Following malfunction actuation, observe: hotwell and condensate storage tank levels decrease, and heat exchanger temperature irregularities on stator coolers and H2 coolers. Operator isolates condensate cooler, then verifies that stator and H2 cooler temperatures stabilize at a higher temperature.

Test Status: 1 Date Completed: 5/19/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.4.8 Malfunction Identifier: CND8

Test Description: Hotwell Level Control Failure. The hotwell level controller LC-1190 fails to a selectable setpoint.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	0-48"		Selection	N/A
Magnitude	N/A	100% = N/A	Magnitude	48"
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

T:L1170A Condenser Hotwell Level
T:L1191 CST Level

Test Precis:

Following malfunction actuation, observe: hotwell level increase, high level alarm annunciates at 38", level indication stabilizes at 48", condensate storage tank level decreases.
Plant is recovered when operator resets malfunction and verifies that the hotwell level returns to a normal level.

Test Status: 1 Date Completed: 5/23/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.6.3 Malfunction Identifier: CRD3

Test Description: Failure of Individual Rod Raise Relay. The selected relay fails to the state selected.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	1-41		Selection	1
Magnitude	D, E	100% = DE-ENRGZD, ENRGZD	Magnitude	E
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	60 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe Gp 4 and rod 1 core mimic out motion position indication. Operator attempts to insert rods in MG and MI modes and observes: rod deviation alarms, a Rod Block signal, and the withdraw lights for Gp 4 remain on.
Operator inserts Gp 4 rods as required to maintain Rx power below 100%.
Plant is recovered when the operator clears the malfunction and verifies: Gp 4 withdraw light is out and Continuous Rod Motion alarm clears. Operator selects MI mode and aligns rod 1 with Gp 4 and observes rod deviation alarms clear.

Test Status: 1 Date Completed: 2/01/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.6.4 Malfunction Identifier: CRD4

Test Description: Failure of Individual Rod Lower Relay. The selected relay fails to the state selected.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	1-41		Selection	1
Magnitude	D, E	100% = DE-ENRGZD, ENRGZD	Magnitude	D
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	60 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, insert Gp 4 rods and observe: Gp 4 lower lights on, rod 1 position indication not changing, Gp 4 rods (except rod 1) inserting on core mimic. Operator selects rod 41 on Gp 4 rod selector switch and sees Gp 4 inserting.
Operator selects MG, then MI on rod mode selector switch and verifies that rod 1 does not insert. Operator verifies normal outward motion of rod 1 in MI.
Plant is recovered when the malfunction is cleared by the operator. Then, rod 1 is aligned with other Gp 4 rods. Rod mode selector switch is returned to MS and proper inward response of rod 1 is verified.

Test Status: 1 Date Completed: 2/01/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.6.5 Malfunction Identifier: CRD5

Test Description: Stuck Rod. The selected rod sticks and does not move; it may be trippable.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-J		Selection	A
Magnitude	T, U	100% = TRIPPABLE, UNTRIPPABLE	Magnitude	U
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	60 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, select MI on rod mode selector switch, Gp 4 on rod group selector switch and rod 1 on rod selector switch, then attempt to move rod 1 with the In-Hold-Out Switch. Verify that rod 1 does not move.
Operator trips the reactor and observes: rod 1 does not insert, reactor power decreases normally, rod position deviation low, low-low, and reed switch alarms annunciate.
Plant is recovered by clearing the malfunction and observing: rod 1 trips, rod deviation alarms (3) clear.

Test Status: 1 Date Completed: 2/01/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.6.6 Malfunction Identifier: CRD6

Test Description: Rod Clutch Failure. The selected rod falls into the core or fails to trip.

Initial Conditions: 100% POWER, BOC, IC#14, GRP 4 ABOVE PDIL

Options Available:			Options Used:	
Selection	1-41		Selection	39
Magnitude	D, E	100% = DE-ENRGZD, ENRGZD	Magnitude	D
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	60 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

FNISLRL1	Linear Range Lower Detector (A)
FNISLRL2	Linear Range Lower Detector (B)
FNISLRL3	Linear Range Lower Detector (C)
FNISLRL4	Linear Range Lower Detector (D)
FNISLRU1	Linear Range Upper Detector (A)
FNISLRU2	Linear Range Upper Detector (B)
FNISLRU3	Linear Range Upper Detector (C)
FNISLRU4	Linear Range Upper Detector (D)

Test Precis:

Following malfunction actuation, observe: rod drop alarms (2), rod indication shows dropped rod, PDIL Gp 4 alarms, flux decreases most on Ch C and least on Ch B, wide range power decreases more on channels C & A than on B & D, power range decreases most on Ch C and least on Ch B, axial power goes more negative on Ch C and more positive on Ch B. Oper^tor observes lower flux near the droppe: rod on the flux map on ERF computer.
Plant is recovered when operator clears malfunction and recovers the dropped rod per AOP-2.

Test Status: 1 Date Completed: 9/12/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.6.7 Malfunction Identifier: CRD7

Test Description: Failure of Clutch Power Supply. The selected power supply(ies) fails.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-D		Selection	A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	60 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: clutch #1 power supply current decreases to 0, [illegible] power on light extinguishes, clutch #2 power supply current increases.
Plant is recovered when operator clears malfunction and observes: clutch power supply currents return to normal and DC power on light illuminates. Operator de-energizes PS1 & 2 and verifies that the rods supplied by the power supply trip.

Test Status: 1 Date Completed: 2/01/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.6.8 Malfunction Identifier: CRD8

Test Description: Rod Ejection. The selected CRDM is ejected from the reactor vessel.

Initial Conditions: 30% POWER, BOC, IC#10

Options Available:			Options Used:	
Selection	1-41		Selection	1
Magnitude	0-100%	100% = 2.75" DIAMETER HOLE	Magnitude	100
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

BRCS101X	Pzr Level Channel X
FNISUPL5	Linear Range Lower + Upper Detector
FNISUPL6	Linear Range Lower + Upper Detector
PRCMSTAR	RCS Global Pressure
T:L599	Containment Sump Level
T:P745	Containment Pressure
T:R050	Containment Air Particulate Activity
T:R051	Containment Air Noble Gas Activity
T:R073	Fuel Transfer Canal Area Monitor
T:R075	Containment Operating Floor Area
T:T714	Containment Air Temp
YCNM861	Dew Point (YE-861)

Test Precis:

Following malfunction actuation, observe: flux rate and wide range power rise; positive startup rate; PDIL Gp 4 and rod deviation alarms; PZR level rises with Ch X & Y alarms; RCS pressure drops with Ch X & Y alarms; letdown goes to minimum; charging pumps start; containment sump level, temperature, dew point, pressure, and radiation levels rise; Rx trip, SIAS. Operator refers to EOP-3.

Test Status: 1 Date Completed: 6/01/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.7.9 Malfunction Identifier: CVC9

Test Description: Charging Line Leak Outside Containment. A variable size leak occurs between the charging pump discharge header and FT-236.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = 2" LINE BREAK	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-360C		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

BWDSSPT	Spent Regen Tank Level
RRMS060	Stack Gas Iodine Rad.
RRMS061	Stack Gas Air Particulate Rad.
RRMS062	Stack Gas High Rad.
T:F236	Charging Flow
T:L101X	Pressurizer Level
T:L219	VCT Level
T:L381	SIRWT Level
T:T202	Regen HX Letdown Outlet Temp
T:T237	Charging Temp
TCHS237	HX CH-6 Outlet Temp
TLDS202	HX CH-6 Outlet Temp
XRCS	Global Boron Concentration in RCS

Test Precis:

Following malfunction actuation, observe: charging flow, temperature, letdown temperature, VCT level decrease; charging flow-related alarms annunciate; standby charging pumps start, discharge pressure decreases; VCT auto makeup starts; PZR level and pressure decrease; VCT low, and low-low level alarms annunciate and charging pump suction switches to the SIRWT; when VCT isolates, its level rises; Waste Disposal System Malfunction alarm annunciates; letdown temperature rises, alarms and TCV-202 closes; CRHS and VIAS actuate with listed attendant alarms, Main Stack and process area monitor alarms annunciate. Operator isolates leak by following OI-CH-1, and terminating charging and letdown.

Test Status: 1 Date Completed: 4/18/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.8.2 Malfunction Identifier: CWS2

Test Description: Main Condenser Tube Leak. The failure occurs to a selectable degree in the selected bundle(s).

Initial Conditions: 100% POWER, IC#14

Options Available:			Options Used:	
Selection	A-D		Selection	A
Magnitude	0-100%	100% = 10% OF THE TUBES	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	N/A
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: condenser A outlet pressure and hotwell level rise, hotwell high level alarm; condensate storage tank level rises; secondary sampling trouble alarm; generator MW decrease with no rod or operator actions.
Operator follows AOP-10.

Test Status: 1 Date Completed: 4/26/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.9.2 Malfunction Identifier: DSG2

Test Description: Diesel Generator Fuel Transfer Pumps Discharge Leak. A variable size leak occurs on the selected diesel's fuel transfer pumps' discharge.

Initial Conditions: 100% POWER, BOC, IC#14, FILL 300 GAL DIESEL FO TK, DG1 RUN

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	0-100%	100% = 1" LINE BREAK	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation observe: fuel oil level in 300 gallon tank decreases, level rise in spent regenerative tank due to floor drain in-flow.

Test Status: 1 Date Completed: 2/01/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.9.8 Malfunction Identifier: DSG8

Test Description: Diesel Generator Failure To Start. The selected diesel generator cranks but fails to start.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	60 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, operator attempts to start DG-1 with emergency pushbutton and observes: Start status light illuminates, then the Diesel Start Fail and Trouble alarms annunciate; the Engine Stopped status light illuminates.
Operator attempts to start diesel again until starting air is exhausted.
Plant is recovered when operator clears malfunction and verifies proper operation of DG-1.

Test Status: 1 Date Completed: 2/05/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.11.1 Malfunction Identifier: EDS1

Test Description: 4160 VAC Bus Fault. The selected bus(ses) is lost due to a single-phase to ground fault on the bus.

Initial Conditions: 100% POWER, BOC, IC#14, CLOSE DESIGNATED CKT BKRS

Options Available:			Options Used:	
Selection	A-D		Selection	C
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

AEDSTB3B	Breaker T1B-3B Ammeter
AEDSTB3C	Breaker T1B-3C Ammeter
T:IT1A3	Transformer T1A3 Current
T:V1B3A	Bus 1B3A Voltage
T:V1B3B	Bus 1B3B Voltage
T:V1B3C	Bus 1B3C Voltage
T:WT1A3	Transformer T1A3 Sec. Watts
VEDS1A3	4160V Bus 1A3 Voltmeter

Test Precis:

Following malfunction actuation, observe: relay 51-1A33 picks up relay 86-1A33 causing DG-1 start, breaker 1A33 trip and lockout, 86/1A33 alarm; Lockout Relay Supervision Tripped, Diesel Auto Start Demand, Breaker Off Auto alarms; Bus 1A3 volts go to 0; transformer T1A-3 watts decrease and amps increase, 4160 bus ground alarm comes in then clears; Bus 1A3 Low Voltage and Bkr Auto Trip alarms; transformer lockout relay 86-1A3-TFB picks up and causes listed actions and alarms; 4160 V Bus 1A3 feeder auto trip, 480 V bus low voltage, Breaker Off Auto, Diesel Auto Start Demand alarms annunciate; 4150/480 V transformer voltages and currents go to 0; listed 4160V and 480V breakers trip with attendant alarms; power lost to busses 1A3, 1C3A, T1B-3D, 1B3A, 1B3A-4A, 1B3B, 1B3C & 1B3C-4C; Rx trip with low flow alarm.
Operator opens all breakers on bus 1A3, selects DG-1&2, their output breakers to OFF and the 43/1A1-1A3 transfer switch to Manual, and observes Diesel Off and 4160V 1A1-1A3 Transfer Off Normal alarms; resets the actuated 86 relays, then stops DG-1&2, verifies listed alarms clear, and stops charging pump 1B if needed.

Plant is recovered when operator clears malfunction, re-energizes 4160V and 480V busses per OI-EE-1&2, verifies listed bus voltages and alarms return to normal, then restarts listed loads and observes normal MW and amps behavior; restores DG-1&2 to normal standby conditions, as listed.

Test Status: 1 Date Completed: 3/31/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.11.2 Malfunction Identifier: EDS2

Test Description: 480 VAC Bus Fault. The selected bus(ses) is lost due to a single-phase to ground fault on the bus on phase 2.

Initial Conditions: 100% POWER, BOC, IC#14, SI2A&2C, CH1A, VA3A, CA1C RUNNING

Options Available:			Options Used:	
Selection	A-I		Selection	A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	D

Direct/Remote/Conditional

Test Parameters Monitored:

None

Test Precis:

Following actuation, observe sequential 480V bus alarms followed by respective breaker tripping, then phase amps and volts go to 0. Selected 480V load breakers trip open (charging pump, ventilation, and containment spray).
Operator starts another charging pump as needed, then transfers busses per OI-EE-02 and observes low voltage alarms clear. Operator places necessary breakers in the trip position and verifies that breaker trip alarms clear.
Plant is recovered when the operator clears malfunction, strips, re-energizes and transfers 480V busses per OI-EE-2 and -2B. Verify volts and amps return to normal following re-energization and restart of loads.

Test Status: 1 Date Completed: 2/19/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.11.3   Malfunction Identifier: EDS3

Test Description: 125 VDC Bus Fault. The selected bus(ses) is lost due to a short on the bus.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	0-3600 s		Ramp Time	300 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	D

Direct/Remote/Conditional

Test Parameters Monitored:

AEDSBAT1	Battery 1 Ammeter
AEDSBC1	125V DC Charger 1 Ammeter
VEDSDC1	125V DC Bus #1 Voltmeter

Test Precis:

Following malfunction actuation, observe DC Bus #1 Ground alarm. After 5 minutes observe: DC Bus 1 ground light illuminates, battery charger feeder trips, output current goes to 0; output current goes to maximum; bus current goes to 0; inverter A, C & 1 trouble, DC Bus 1 low voltage, Panel AI-41A undervoltage, 125 VDC Aux Sup Not Avlble-D2 alarms; Normal Source 125 VDC, Battery #1 (Normal) 125 VDC, DC Distribution Panel 1 lights out; power loss to 125 VDC loads and listed control power.
Operator transfers AI-41A and 125 VDC control power to listed busses, then verifies power returns and alarms clear.
Plant is restored when operator clears malfunction, restores battery chargers and inverters to listed pre-test configurations, and verifies listed alarms, power and voltage returned to normal.

Test Status: 1   Date Completed: 4/02/90
atisfactory; 2 = More Testing Required; 3 = Unsatisfactory

E Compliance:

test reveal any exception to ANSI/ANS 3.5? No

If yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.11.4 Malfunction Identifier: EDS4

Test Description: 120 VAC Instrument Bus Fault. The selected bus(ses) is lost due to single-phase to ground fault on the bus.

Initial Conditions: 100% POWER

Options Available:			Options Used:	
Selection	A-F		Selection	A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	0-3600 s		Ramp Time	300 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	D

Direct/Remote/Conditional

Test Parameters Monitored:

AEDSINVA 120V AC Inverter Ammeter
VEDSIBA 120V AC Bus A Voltmeter

Test Precis:

Following malfunction actuation, observe bus ground light goes bright. After 5 minutes, observe: bus feeder breaker trips, inverter output current pegs high, then goes to 0, bus voltage goes to 0, low voltage alarm annunciates, and loss of power.
Operator attempts to feed AI-40A from AI-40C per OI-EE-4.0, verifies that the AC-1 or -2 trips due to continuing ground, then opens AC-1 and -2.
Plant is recovered when operator clears malfunction, closes the normal feeder from inverter A, bus voltages and inverter current return to normal, low voltage alarm clears, and verifies power to loads.

Test Status: 1 Date Completed: 5/03/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.11.6 Malfunction Identifier: EDS6

Test Description: 480 VAC Supply Transformer Fault. A fault occurs on the selected transformer(s).

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-G		Selection	N/A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	D

Direct/Remote/Conditional

Test Parameters Monitored:

None

Test Precis:

Following actuation, observe: xfmr hi temperature alarm, xfmr breakers trip, 4160V & 480V xfmr and bus tie, low voltage, xfer switch and Aux Sup Not Avail alarms annunciate, 4160/480V xfmr voltage & amps at 0, power loss to loads, 480V pump bkrs open.
Operator opens circuit breaker control switches and observes the breaker trip alarms clear, then starts a charging pump as needed.

Test Status: 1 Date Completed: 2/18/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.11.11 Malfunction Identifier: EDS11

Test Description: Sw'tchyard Line Fault. A single phase to ground fault occurs on Phase A of the selected line.

Initial Conditions: 100% ...ER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B, C		Selection	C
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: relay 87 161 picks up causing Lockout Relay Supervision Tripped alarm; relay 86-161 trip with 161 KV alarm; relays 86-1/T1A-3 & -2/T1A-3 trip with listed breaker trips and DG-1 start at idle, and (5) alarms; relays 86-1/T1A-4 & -2/T1A-4 trip, with DG-2 start at idle and (2) alarms; breakers 1A13 & 1A24 close with alarms; transformers T1A-4 & -3 watts, current, and voltage go to 0; T1A-1 & -2 watts and current rise.

Operator follows breaker indications with control switches and verifies breaker trip alarms (3) clear.

Plant is recovered when operator clears malfunction, resets lockout relays, observes alarms clear, stops DG-1 & -2, restores electrical lineup to pre-test conditions and observes listed normal indications and alarms.

Test Status: 1 Date Completed: 4/09/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.11.12 Malfunction Identifier: EDS12

Test Description: Switchyard Breaker Failure. The selected breaker contacts weld shut or the selected breaker trip mechanism activates.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B, C		Selection	A
Magnitude	0, C	100% = OPEN, FAILS TO OPEN	Magnitude	0
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe breaker 3451-4 opens with alarm. Operator opens breaker 3451-4 control switch and observes alarm clear.
Plant is recovered when operator clears malfunction and closes breaker 3451-4.

Test Status: 1 Date Completed: 2/24/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.12.1 Malfunction Identifier: EHC1

Test Description: EH Fluid System Leak. A variable size leak occurs on the EH fluid accumulator inlet line.

Initial Conditions: 100% POWER, BOC, IC#14, L013A RUN, L013B STBY

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = DOUBLE SHEAR	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

BEHCRES	Hydraulic Fluid Level in Reservoir
PEHCFAS	FAS Fluid Pressure
YEHP13A	Hydraulic Fluid Pump A
YEHP13B	Hydraulic Fluid Pump B

Test Precis:

Following malfunction actuation, observe: EHC pressure decrease, amps rise, pump B starts with alarm and pressure decreases more slowly; Hydraulic Oil Press Lo, Hydraulic Power Unit Fluid Level Hi-Lo alarms; turbine and Rx trip; EHC Mechanical, Emergency lights illuminate, Hydraulic Fluid Pressure light goes out; all turbine stop, control and combined intercept valves close. After 5-10 minutes, observe Hydr Fluid Press pump A & B stopped alarms.

Test Status: 1 Date Completed: 4/18/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.12.6 Malfunction Identifier: EHC6

Test Description: Load Limit Potentiometer Failure. The load limit potentiometer's output fails to change in the selected deadband.

Initial Conditions: 50% POWER, BOC, IC#12

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-5%	100% = N/A	Magnitude	5
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following actuation, operator slowly raises load to 60% with the load limiter and observes erratic potentiometer behavior. Load is raised to 70%; observe smooth pot operation, then lower load to 40%. Observe erratic pot operation between 55% and 50%.
Plant is recovered when operator clears malfunction. Operator then verifies a smooth load increase to 60% using the load limiter potentiometer.

Test Status: 1 Date Completed: 4/18/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.13.1 Malfunction Identifier: ESF1

Test Description: Steam Generator Low Pressure Logic Matrix Failure. The logic matrix for the selected train(s) fails to the selected condition(s).

Initial Conditions: 100% POWER, EOC, IC#24

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	T, F	100% = ON (ACT), OFF	Magnitude	T
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe indications of SGLS & SGIS actuation, reactor trips, RCS temperature response tracks MSSV cycling, PZR level response follows Tave, then program setpoint, PZR pressure and level CH X & Y alarms annunciate. Feedwater Control S/G RC-2A, -2B low level alarms annunciate, S/G pressures rise, S/G levels decrease, S/G feedwater and steam flows go to 0, feedwater pump discharge pressure rises and suction flow decreases, feedwater recirc valves open. Condensate pumps discharge low flow alarms annunciate. Observe the following: RCS temperature and pressure stabilize at temperature corresponding to MSSV setpoints, S/G levels decrease, AFAS actuation at 32% with appropriate alarms and actions. Observe proper AFW flow to S/G's, and that valves close and alarms clear when S/G levels reach 60%. Verify proper cycling of AFW valves and attendant alarms as S/G levels vary between 32% and 60%.
Operator follows EOP-06.
Recovery is achieved by shutting down feedwater and 2/4 RCP's, clearing malfunction, and resetting SGLS relay. Operator verifies: alarms clear, feedwater valves can be opened, MSIV's open. Operator then starts and observes RCS cooldown.

Test Status: 1 Date Completed: 4/19/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.13.2 Malfunction Identifier: ESF2

Test Description: Containment High Pressure Logic Matrix Failure. The logic matrix for the selected train(s) fails to the selected condition(s).

Options available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	T, F	100% = ON (ACT), OFF	Magnitude	T
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: CPHS, SIAS, and 480V Load Shed actuate with listed alarms and indications; SGIS actuates with listed valve closures and alarm annunciation; Reactor Trip alarms. Diesel generators start, load sequencers S1-1 & S2-2 actuate with listed alarm annunciation; CIAS and VIAS actuate with listed alarms. Operator verifies listed valves can be opened after turning HC-AI-43A to test and resetting CPHS.
Plant is recovered when the operator clears the malfunction, resets listed 86 relays, observes alarms clear and, as desired, repositions valves and equipment operated during this test.

Test Status: 1 Date Completed: 1/18/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.13.5 Malfunction Identifier: ESF5

Test Description: Pressurizer Low Pressure Logic Matrix Failure. The logic matrix for the selected train(s) fails to the selected condition(s).

Initial Conditions: 100% POWER, BOC, IC#14, PPLS NOT BLOCKED, ALL 86 RLYS ON AI-30A/B RESET, DERIVED SIGNAL C/O ON AI-30A IN EMERG STBY

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	T, F	100% = ON (ACT), OFF	Magnitude	T
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: PPLS actuates with listed alarm annunciation; SIAS, diesel generator start, and CIAS signals received, Sequencers S1-1 and S2-2 actuate.
Plant is recovered when operator clears malfunction, resets tripped 86 relays, and observes alarms annunciated during this test cleared.

Test Status: 1 Date Completed: 1/18/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.13.10 Malfunction Identifier: ESF10

Test Description: Open Safety Injection Valves Actuation Failure. The actuation signal for the selected train(s) fails to the selected condition(s).

Initial Conditions: 100% POWER, BOC, IC#14, ESF RELAYS RESET, 480 V LOAD SHED A&B EMERG STBY, VA12A, FW34A, DW-41A, -43A, -46A, VA46A, FW30A, ST6A RUNNING

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	T, F	100% = ON (ACT), OFF	Magnitude	T
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

1. Following malfunction actuation, observe: SIAS actuation via 86A & 86AX relay flags, and SIAS alarms in ERF and on panel DI/004; 21 listed valves open, pump CH-4A starts, and verifies 10 listed valves close or cannot be opened. Observe VIAS actuation.

2. 480V loads shed with attendant alarms and operator observes listed loads are de-energized; then after a 2½-50 second delay, verifies listed loads are, or can be, energized; then resets and verifies red light on HC-103-3 & -4 is lit.

3. Plant is recovered when the operators clears the malfunction, resets all tripped 86 relays and then, as desired, reconfigures all valves and equipment operated during this test.

Test Status: 1 Date Completed: 2/01/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.13.12 Malfunction Identifier: ESF12

Test Description: OPLS Logic Matrix Failure. The logic matrix for the selected train(s) fails to the selected condition(s).

Initial Conditions: 100% POWER, BOC, IC#14, BKRS CLOSED: AC-10A,-10B,-10C,-10D, SI-1A,-1B, FW6, 1A13., 1A33, 1A24, 1A24, 1A44, FW8A, VA52A, T1B3A, T1C-3A,-4A, FW-2C,-4C,-5C, CW1C, MCC-3B2,-3B3,-3C-4C-1

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	T, F	100% = ON (ACT), OFF	Magnitude	T
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: 86A/OPLS trips with alarm; breakers 1A13 & 1A33 trip, DG-1 starts and accelerates to 900 rpm, bus 1A3 load sheds; breakers 1A24 & 1A44 trip, DG-2 starts and accelerates to 900 rpm, bus 1A4 load sheds; supply breakers to MCC-3B2, -3B3, -3C-4C-1 de-energize; VA-52, CA-4, FW-8A breakers trip.
Operator stops SI-1A, closes breaker 1AD1 and energizes bus 1A3, then stops SI-1B, closes breaker 1AD2 and energizes bus 1A4.
Plant is recovered when operator clears malfunction; resets 86A/OPLS relay, observes 86A OPLS Trip alarm clears; closes breakers 1A13, 1A33, 1A24, and 1A44; unloads and shuts down DG-1 & -2, then restores equipment to pre-test configuration.

Test Status: 1 Date Completed: 2/24/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.14.2 Malfunction Identifier: FDW2

Test Description: Main Feedwater Header Leak. A variable size leak occurs on the main feedwater header between PT-1141 and PT-1397.

Initial Conditions: 50% POWER, IC#12

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = 18" DIAMETER BREAK	Magnitude	50
Ramp Time	0-3600 s		Ramp Time	600 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following actuation, observe: reheater 6 A/B outlet, feedwater pump discharge pressures decrease; feedwater pump suction flow rises; S/G feedwater flows & levels decrease; Feedwater Control S/G low, Turbine Bld Sump hi level alarms annunciate. Rx trip.
Operator follows EOP-06, Loss of Feedwater. Test concludes when operator attempts to clear malfunction.

Test Status: 1 Date Completed: 2/08/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.14.3 Malfunction Identifier: FDW3

Test Description: Main Feedline Leak Upstream of FCV. A variable size leak occurs on the selected feedline(s) between the flow element and the FCV.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	0-100%	100% = 16" DIAMETER BREAK	Magnitude	10
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: S/G RC-2A feedwater flow rises, level decreases, level controller decreases, feedwater regulator flow rises, low level alarm annunciates, S/G B level decreases slower than S/G A, S/G A low level causes Rx trip. Operator verifies leak location after AFWS actuation by manipulating feedwater alignment. Observe Waste Disposal System Malfunction alarm. Operator closes HC-1384, then follows EOP-06, Loss of Feedwater. Test ends with attempt to clear malfunction.

Test Status: 1 Date Completed: 2/08/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.14.5 Malfunction Identifier: FDW5

Test Description: Main Feedline Leak Inside Containment. A variable size leak occurs on the selected feedline(s) downstream of the check valve.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	0-100%	100% = 16" DIAMETER BREAK	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: S/G feedwater flow rises, S/G RC2-A pressure & level decrease; S/G RC-2A low level alarm annunciates; Rx trips; S/G low level, low pressure channel pre-trip & trip alarms annunciate. S/G 2A steam flow, pressure and level decrease to 0 and SGIS actuates as S/G boils dry. Containment sump high level alarm annunciates. RCS temperature & pressure, and PZR level decrease; SIAS actuates at 1600 psia.
Containment high pressure alarms annunciate and CPHS actuates. The operator follows EOP-05, Uncontrolled Heat Extraction. When the S/G boils dry, observe that the RCS cooldown stabilizes.

Test Status: 1 Date Completed: 2/08/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.16.1 Malfunction Identifier: FWH1

Test Description: Feedwater Heater Tube Leak. Tube failure occurs to a selectable degree in the selected heater(s).

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-L		Selection	K (6A)
Magnitude	0-100%	100% = 10% OF TUBES	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

BSGN903X	S/G A Transmitted Level (NR%)
BSGN906X	S/G B Transmitted Level (NR%)
PCFWC1	Condenser Steam Pressure
STUR	Gross Generator Electrical Power Output (MW)
T:L1196A	Htr 6A Level Control
T:L1197A	Htr 5A Level Control
T:P958	2nd Stage Extraction Pressure
T:T1209A	Heater 6A Drain Temp.

Test Precis:

Following malfunction actuation, observe: heater 6A level and extraction pressure rising, drain temperature decreases; heater 5A level rises rapidly; S/G level decreasing and FW flow rising; hotwell level rising, heater 6A extraction valve closes, and condenser vacuum decreasing due to 6A high level dump; standby vacuum pumps start; Htr 6A hi-lo level alarm; generator MW decrease.
Operator isolates heater 6A and reduces power to 60% per EOP-5, Uncontrolled Heat Extraction.

Test Status: 1 Date Completed: 4/02/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.17.1 Malfunction Identifier: GEN1

Test Description: Voltage Regulator Failure. The Voltage Regulator changes the output voltage to the setpoint selected.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	80-120%	100% = RATED VOLTAGE	Magnitude	120
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

AGENG1F	Generator Field Ammeter
PGEN1	Power Factor Meter
SGEN1	Generator Output Imag. Power (MVARS)
T:IGEN1	Main Generator Current
VGENG1F	Gen Field Volts Meter

Test Precis:

Following malfunction actuation, observe: generator picks up more reactive load; leading power factor rises; voltage regulator transfer voltage rises; field amps and volts, and generator output amps rise with field overvoltage alarm. After 10 seconds, voltage regulator trips to manual mode with alarm; parameters effected return to pre-malfunction conditions, except the voltage regulator transfer volt meter. Operator places regulator switch in the manual position and observes the field overvoltage and regulator trip alarms clear, then manually adjusts the voltage regulator to maintain required reactive load.
Plant is recovered when the operator clears the malfunction and transfers the voltage regulator back to pre-test automatic operation.

Test Status: 1 Date Completed: 4/18/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.17.4 Malfunction Identifier: GEN4

Test Description: Field Breaker Failure. The field breaker fails to the position selected.

Options available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	O, C	100% = OPEN, CLOSED	Magnitude	O
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, operator starts up generator per OI-ST-9 and observes: field breaker does not close, field breaker mismatch light illuminates, and Exciter Field Breaker Tripped alarm annunciates. Operator returns field breaker control switch to OFF and observes above alarms and indications return to normal. Plant is recovered when operator clears malfunction, starts up generator and verifies that the field breaker closes.

Test Status: 1 Date Completed: 2/15/90
1 = Satisfactory; 2 = More Testing Required; 3 =/ Unsatisfactory/

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.18.1 Malfunction Identifier: MSS1

Test Description: Main Steam Line Leak Inside Containment. A variable size leak occurs on the selected steam line inside containment.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	0-100%	100% = 28" DIAMETER BREAK	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

BSGNWR	S/G A Wide Range Level
BSGNWR2	S/G B Wide Range Level
PCNM	Total Containment Pressure
PRCMSTAR	RCS Global Pressure
PSGNS	S/G Steam Pressure
PSGNS2	S/G B Steam Pressure
TCNM	Containment Temp
TRCSWRC	Wide Range Cold Leg Temp
TRCSWRH	Wide Range Hot Leg Temp
TRCSWRH2	Wide Range Hot Leg Temp
WAFWSGN	Aux Feed Flow to Steam Generators
WAFWSGN2	Aux Feed Flow to Steam Generators
WCFWSGN	Feedwater Flow to Steam Generators
WCFWSGN2	Feedwater Flow to Steam Generators
WSGNSLIN	Steam Line Flow to Main Steam Header
WSGNSLIN2	Unknown Variable

Test Precis:

Following malfunction actuation, observe: S/G RC-2A steam pressure drops, steam temperature and flow decrease; RC-2B, Main steam, and turbine first stage pressure and temperature decrease; S/G levels and RCS temperature decrease; Tref/Tavg deviation alarms annunciate; RCS pressure decreases with alarms; PZR heaters energize; letdown flow decreases to minimum; PZR level Ch X & Y alarms; S/G low level alarms; containment pressure rises with (4) alarms; Rx trips, CPHS, SIAS, VIAS, CIAS, SGLS, AFWS all actuate with listed alarms, actions, and indications; containment sump level rises with listed attendant alarms. Following AFWS, operator verifies no AFW flow to S/G RC-2A, RC-2B level recovers, RC-2B pressure rises to MSSV setpoint. Operator refers to EOP-5, Uncontrolled Heat Extraction Procedure. Plant is recovered when RCS is stable, operator resets all safeguards signals and begins RCS cooldown on S/G RC-2B.

Test Status: 1 Date Completed: 6/15/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.18.3 Malfunction Identifier: MSS3

Test Description: Main Steam Line Leak Outside Containment (Non-Isolable). A variable size leak occurs on the selected steam line outside of containment.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	0-100%	100% = 28" DIAMETER BREAK	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	600 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

PZR	Abbreviation for Pressurizer
PZR	Abbreviation for Pressurizer
SGA	S/G A Water/Steam Masses

Test Precis:

Following malfunction actuation, observe: S/G RC-2A steam pressure, temperature, and flow decrease; RC-2B pressure and temperature decrease, flow rises; main steam and turbine 1st stage pressure decrease; RC-2A level swells, then decreases with low level alarm; RC-2B level, RCS temperature and pressure decrease; Tref/Tavg deviation and PZR pressure Ch X & Y alarms; PZR backup heaters energize; TM/LOW Pressure Pretrip and trip, Subcooled Margin Low, High Power pretrip and trip alarms; Rx trip; (4) PZR SI signal lo-lo alarms; PPLS actuation with listed (4) alarms annunciated and (2) cleared, and ERF indications; PZR level drops, letdown flow goes to minimum, HI-LO Ch X & Y alarms, standby charging pumps start; VCT level decreases with suction switchover to SIRWT, VCT LO-LO level alarms; PZR LO-LO Ch X & Y alarms, backup heaters de-energize; SIAS, VIAS, CIAS, SGLS, and AFWS actuations with listed actions and alarms; AFW flow to RC-2B; RCP's cavitate; PZR and RC-2B levels recover; RC-2B pressure rises to MSSV setpoint. Operator stops RCP's when cavitation is observed and refers to EOP-5, Uncontrolled Heat Extraction Procedure.
Plant is recovered when parameters have stabilized, operator resets all safeguards signals, and RCS cooldown with RC-2B has started.

Test Status: 1 Date Completed: 5/03/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.18.5 Malfunction Identifier: MSS5

Test Description: Main Steam Isolation Valve Failure. The selected MSIV(s) fails closed.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

SG-RC2A pressure and flow decrease, level decreases then increases; RCS Delta T decrese loop 1, increase loop 2; PRZ pressure increases; Gen. watts decrease; ASGT Lo Pressure Channel Pre-trip and Trip Reactor trips on ASGT. Operator refers to EOP-00, Reactor Trip.

Test Status: 1 Date Completed: 2/23/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.18.6 Malfunction Identifier: MSS6

Test Description: Main Steam Line To TDAFW Pump Leak. A variable size leak occurs on the selected line(s) supplying the TDAFWP between the stop valve & check valve.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	0-100%	100% = 2" DIAMETER BREAK	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe the FW-10 red light on and the aux oil pump stops. Operator closes HC-1045B and observes FW-10 red light off, recirc valves open, FW-10 running alarm clears, recirc flow = 0. Operator opens HC-1045B, resets trip latch and YCV-1045, then observes: FW-10 red light on then off, recirc valve opens, FW-10 running alarm.

Test Status: 1 Date Completed: 4/18/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.18.7 Malfunction Identifier: MSS7

Test Description: Main Steam Header Leak. A variable size leak occurs on the common main steam header.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = 36" DIAMETER BREAK	Magnitude	10
Ramp Time	0-3600 s		Ramp Time	600 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Status: 1 Date Completed: 2/24/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5 19.2 Malfunction Identifier: NIS2

Test Description: Wide Range Power Supply Failure. The selected power supply for the selected channel(s) fails.

Initial Conditions: 100% POWER, BOC, IC#14, SELECT CH A

Options Available:			Options Used:	
Selection	A-H		Selection	A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: POWER ON light goes out, power indications on MCB and NIS panel fail to 0, NIS startup rate fails to 0, HV indication fails low, NI channel inoperative alarm, bistables fail to trip position with NIS drawer lights off, zero power mode permissives enabled, extended range circuit de-energized. Operator performs surveillance ST-RPS-2 to verify circuit failure. Plant is recovered when operator clears malfunction and observes listed indications and alarms return to pre-test conditions.

Test Status: 1 Date Completed: 4/2/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.19.7 Malfunction Identifier: NIS7

Test Description: Power Range Power Supply Failure. The high voltage power supply for the selected channel(s) fails.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-F		Selection	E
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	60 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: HV detector meter fails to 0, bistable trip light illuminates, NI channel inoperative alarm, upper and lower power level meters fail to 0, power ratio meter rises, rod drop bistable trip with alarms, Level 1 trip light goes out, POWER ON light remains lit.
Operator checks ZERO and CALIBRATE positions on Channel 9 upper and lower function switches and observes readings of 200% in CALIBRATE and 0% in ZERO positions.
Plant is recovered when operator clears malfunction and observes all Channel 9 indications return to normal.

Test Status: 1 Date Completed: 1/28/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.20.4 Malfunction Identifier: PRS4

Test Description: PZR Steam Space Leak. A variable size leak occurs from the upper head of the pressurizer.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = 8" DIAMETER HOLE	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

PCNM Total Containment Pressure
PRCMSTAR RCS Global Pressure

Test Prec.s:

Following malfunction actuation, observe: PZR pressure and level decrease, backup heaters energize; VCT level decreases with LO-LO Level alarm, and charging pump suction switches to SIRWT; charging flow, containment pressure, temperature, activity, dew point, and sump level rise. Operator implements EOP-01, Reactor Trip.

Test Status: 1 Date Completed: 4/19/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.20.5 Malfunction Identifier: PRS5

Test Description: Pressurizer PORV Failure. The selected PORV(S) fails to the position selected.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	0-100%	100% = N/A	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

PCNM	Total Containment Pressure
PRCMSTAR	RCS Global Pressure
T:L101X	Pressurizer Level
T:L132	PQT Level
T:P131	Quench Tank Pressure
TCNM	Containment Temp

Test Precis:

Following malfunction actuation, observe: acoustic monitor and alarm indicate PORV is open; PZR pressure decreases; PORV discharge temperature rises and alarm annunciates; PZR level goes solid and depressurization rate rises, HI-LO level Ch X & Y TM/LOW Pressure pretrip, and Subcooled Margin Low alarms annunciate; Rx trips on TM/LP BTU with alarms; (4) PZR SI LO-LO pressure alarms; PPLS actuates; PQT pressure, temperature and level rise with attendant alarms, rupture disc blows at 75 psig with rapid pressure drop; containment pressure, dew point, temperature, activity and sump level rise.
Operator isolates PORV, observes related alarms clear and closed indication, then PZR pressure stabilizes.

Test Status: 1 Date Completed: 3/27/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.20.9 Malfunction Identifier: PRS9

Test Description: Pressurizer Level Instrumentation Tap Leak. A variable size leak on the pressurizer instrument tap.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-D		Selection	A
Magnitude	0-100%	100% = 1" DIAMETER HOLE	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

PRCMSTAR	RCS Global Pressure
T:L101X	Pressurizer Level
T:P102A	Pressurizer Pressure

Test Precis:

Following malfunction actuation, observe: PZR pressure decreases to lower limit, SI LO-LO pressure alarms, Channel A TM/LP Trip with (3) alarms, PPLS Matrix lights change state. Operator bypasses trip unit and verifies yellow light on.
Plant is recovered when operator clears malfunction, observes PZR pressure returns to normal and alarm clears, resets BTU 9 Ch A and verifies indications return to pre-test values.

Test Status: 2 Date Completed:
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.21.1 Malfunction Identifier: RCP1

Test Description: RCP Lube Oil Cooler Leak. A variable size leak occurs between CCW and the lube oil system of the selected RCP upper lube oil cooler.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-D		Selection	A
Magnitude	0-100%	100% = 10% OF TUBES	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

BRCP3101	RCP Upper Oil Reservoir Level
ORCP1	RCP Pump Speed (RPM)
TRCP3105	RCP Lower Thrust Bearing Temp
TRCP3106	RCP Upper Thrust Bearing Temp
TRCP3107	RCP Upper Bearing Temp
WCCW454	Lube Oil Cooler A Flow
WRCP3182	RC-3A Reverse Flow Switch
YRCP3108	Vibration Set Point (RC-3A)

Test Precis:

Following malfunction actuation, lube oil leaks into the CCW system. Observe: CCW from RCP-3A lube oil cooler high temperature alarm; lube oil flow and reservoir level decrease with attendant alarms; RCP bearing temperatures rise; lube oil levels fluctuate; RCP high vibration alarm; RCP trips with attendant alarm; Rx trip. Operator refers to EOP-1.
Operator secures RCP-3A and observes RC-3A breaker trip alarm cleared, then stops an RCP in the opposite loop and begins a plant cooldown.

Test Status: 1 Date Completed: 2/23/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.21.3 Malfunction Identifier: RCP3

Test Description: RCP Guide Bearing Failure. The selected bearing(s) fail.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-H		Selection	A
Magnitude	0-100%	100% = PUMP SEIZURE	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored: RCP3

ORCP3	RCP Pump Speed (RPM)
T:T3107	RC-3A Upper Guide Bearing Temp
YCPPRC3A	RCP 3A Amps
YRCP3108	Vibration Set Point (RC-3A)

Test Precis:

Following malfunction actuation, observe: RCP-3A upper guide bearing temperature rises with attendant alarm, RCP-3A high vibration alarm, pump seizes.

Test Status: 1 Date Completed: 1/23/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.21.9 Malfunction Identifier: RCP9

Test Description: RCP Lower Seal Failure. The lower seal on the selected RCP(s) fails.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-D		Selection	A
Magnitude	0-100%	100% = COMPLETE SEAL FAIL	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored: RCP9

P3116	RC-3A Controlled Bleed-Off Pressure
P3117	RC-3A Middle Seal Pressure
P3118	RC-3A Upper Seal Pressure
T:T3114	RC-3A Seal bleedoff Temp
WSFA3115	RCP 3A Main Header Flow

Test Precis:

Following malfunction actuation, observe: RCP-3A middle seal inlet pressure rises from 1400 to 2100 psia with attendant ERF alarm; upper seal inlet and outlet pressures and seal bleedoff flow may rise, seal leakage high flow alarm annunciates.

Test Status: 1 Date Completed: 1/23/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.22.1 Malfunction Identifier: RCS1

Test Description: RCS Loop Leak. A variable size leak occurs on the selected RCS loop(s).

Initial Conditions: 100% POWER, BOC, IC#14, SELECT PRETRIP ON CH A DVM, SELECT TEMP ON SCMMA & SCMMB

Options Available:			Options Used:	
Selection	A-H		Selection	C
Magnitude	0-100%	100% = LINE DIAMETER	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C (Direct/Remote/Conditional)		Mode	D

Test Parameters Monitored:

BRCMMGFN1	RC Vessel Mixture Level
T:F313	Loop 1B HPSI Flow Indication
T:F315	Unknown Variable
T:L101X	Pressurizer Level
T:L2904X	SI-6A Level Indication
T:L2924X	SI-6B Level Indication
T:L2944X	SI-6C Level Indication
T:L2964X	SI-6D Level Indication
T:LD383	SIRWT Level
T:P115A	Pressurizer WR Pressure
T:P783	Wide Range Containment Pressure
T:T714	Containment Air Temp
T:TCET12	T-8 Core Exit Thermocouple

Test Precis:

Following malfunction actuation, observe: RCS pressure drops rapidly with low pressure Ch X & Y alarms, backup heaters energize; TM/LP pretrip and Subcooled Margin low alarms; Rx trips on TM/LP with attendant alarms and indications. Operator verifies Rx trip response, then observes: (4) PZR SI Lo-Lo pressure alarms; PPLS actuation with attendant listed alarms and actions; PZR level drops rapidly with Ch X & Y alarms, letdown flow goes to minimum, standby charging pumps start; VCT level decreases with alarm, charging pump suction shifts to SIRWT; PZR lo-lo Ch X & Y alarms; Rx vessel decreases; PZR backup heaters de-energize; containment pressure rises with attendant alarms; CPHS actuation with attendant actions and alarms; RCP's cavitate; Safety Injection Tanks inject with listed attendant alarms; containment activity rises and CRHS actuates with listed attendant alarms and actions; SIAS, VIAS, CIAS, CSAS, SGIS actuate with listed attendant alarms and actions; containment sump/water level rises with listed attendant alarms; containment dew point rises; HPSI/LPSI pressure and flows; CSS flow causes containment pressure decrease; SIRWT level decreases with listed alarms and actions; RAS actuates at 10" H20 with alarms and actions. Operator performs EOP-3 and observes Rx vessel level recovers, RCS temperature and pressure stabilize.

Test Status: 2 Date Completed:
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

TROUBLE REPORT #/DESCRIPTION:

4161 / Sequencer timers did not print out properly
3987 / RMS recorders not working

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.22.3 Malfunction Identifier: RCS3

Test Description: RCS Fuel Failure. RCS fuel rods fail causing the RCS activity to increase.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-2%	100% = 2% OF ALL FUEL FAILS	Magnitude	2
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	N/A
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

T:R053 CCW Pump Suction Header Activity
T:R214 Failed Fuel Detector

Test Precis:

Following malfunction actuation, observe rising readings on I-135 and gross activity monitors; Reactor Coolant Gamma Activity High alarm annunciates.
Operator inserts a letdown Hx tube leak and observes the CCW radiation monitor signal rises rapidly and process radiation high alarm annunciates.
Plant is recovered when operator clears malfunction and observes radiation monitor signal decays slowly.

Test Status: 2 Date Completed:
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.24.1 Malfunction Identifier: RPS1

Test Description: Failure of Interposing Relay. The selected interposing relay(s) fail to the position selected.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-D		Selection	A
Magnitude	D, E	100% = DE-ENRGZD, ENRGZD	Magnitude	D
Ramp Time	N/A		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe that the interposing relays de-energize causing a half-trip as indicated by: control power ground, PS1 & PS3 AC trouble, AC on, and DC on lights extinguish; M1 coil voltage goes to 0, trip channel 1 light comes on; output current meters for PS1 & PS3 decrease, output current meters for PS2 & PS4 rise.
Plant is recovered when operator clears malfunction and observes that all indications return to normal.

Test Status: 1 Date Completed: 1/23/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.24.2 Malfunction Identifier: RPS2

Test Description: RPS Power Supply Failure. The selected ladder logic power supply(ies) fails.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-L		Selection	A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: power supply light 5 on RPS power supply drawer goes out, AB-1 & -2 matrix relays de-energize and status lights go out, a half-trip will occur with listed attendant indications.
Operator performs ST-RPS-5, F.2, R10 for Ch A, but does not bypass Trip Unit; and observes TU-8A trip 2 & 3 lights illuminate, but trip 1 light does not.
Plant is recovered when operator clears malfunction and observes that all RPS indications return to normal.

Test Status: 1 Date Completed: 1/28/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.24.3 Malfunction Identifier: RPS3

Test Description: Failure Of APD Positive Limit Calculator. The output of the APD positive limit computer fails to the range selected.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A,B,C,D		Selection	A
Magnitude	50-150%	100% = NORMAL OUTPUT	Magnitude	50
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

1. Following malfunction actuation, observe the APD positive limit meter decreases by 50%. Operator then verifies RPSCIP meter indication correlates with control board meter indication.

2. Operator places TU-12 unit A in bypass, then performs surveillance ST-RPS-12, R33 to verify improper operation of APD summing amplifier.

3. Plant is recovered when operator clears malfunction and verifies all indications have returned to normal. Remove TU-12A from bypass.

Test Status: 1 Date Completed: 1/28/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.25.7 Malfunction Identifier: RRS7

Test Description: Steam Dump Quick Opening Solenoid Valve Failure. The quick opening solenoid valve fails to the position selected.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-E		Selection	A
Magnitude	D, E	100% = DE-ENRGZD, ENRGZD	Magnitude	E
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: TCV-909-1 red light on; TCV-909-2, -3, -4 green lights on; S/G RC-2A, -2B steam flows and levels rise; Rx-to-turbine power mismatch as nuclear power rises and turbine power decreases.
Operator closes air to solenoid for TCV-909-1 and observes: green indication light on, RC-2A, -2B steam flows decrease, Rx-to-turbine power mismatch disappears, generator megawatts return to normal.
Plant is recovered when operator clears malfunction, opens air to solenoid for TCV-909-1, and observes that TCV-909-1 remains closed.

Test Status: 1 Date Completed: 2/20/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.26.3 Malfunction Identifier: RWS3

Test Description: Raw Water Supply Line Break. A variable size leak occurs on the selected Raw Water line downstream of the flow element.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	0-100%	100% = 16" PIPE BREAK	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: RW supply flow rises, supply header low pressure alarm annunciates, CCW Hx outlet temperature rises, RW supply pressure decreases, RW-cooled loads (listed) will heat up, Waste Disposal alarm annunciates. Operator isolates the leak by closing valves, then starts a pump in the not-faulted loop and observes supply header low pressure alarm clears. Operator secures pump in faulted loop, then shifts to alternate CCW Hx. Isolated header flow goes to 0 and temperatures return to normal.

Test Status: 1 Date Completed: 2/14/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.27.2   Malfunction Identifier: SDC2

Test Description: Shutdown Cooling Heat Exchanger Inlet Header Leak. A variable size leak occurs on the Shutdown Cooling Heat Exchangers' inlet header between SI-169 & SI-170.

Initial Conditions: COLD S/D, BOC, IC#4

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = 12" pipe break	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuat`'n, observe: shutdown cooling flow and pressure, and PZR level decrease; Waste disposal System Malfunction alarm; CRHS, VIAS actuation with listed attendant alarms and indications; listed high activity and radiation levels and alarms; RCS temperature rises; PZR pressure and temperature decrease along saturation curve. Operator follows AOP-19, Loss of Shutdown Cooling.

Test Status: 1   Date Completed: 3/28/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.30.1 Malfunction Identifier: SGN1

Test Description: Steam Generator Tube Rupture. Tube failure occurs to a selectable degree in the selected steam generator(s).

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	0-100%	100% = 10 TUBES	Magnitude	10
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

F1101	S/G A Feedwater Flow
F1102	S/G B Feedwater Flow
L911D	S/G A Wide Range Level
P115A	Pressurizer Wide Range Pressure
P913A	S/G A Wide Range Pressure
P914A	S/G B Wide Range Pressure
PRCMSTAR	RCS Global Pressure
PSGN902A	S/G A Pressure in Level Ref. Leg
R057	Condenser Off Gas Radiation
T112H2	Unknown Variable
T:L219	VCT Level
TRCSWRH	Wide Range Hot Leg Temp
WRCSSGNL	SGTR Liquid Flow
WRCSSGNS	SGTR Steam Flow

Test Precis:

Following malfunction actuation, observe: PZR level and pressure decrease, backup heaters energize; HI-LO, then LO-LO Ch X & Y level alarms annunciate, backup heaters trip, PZR Off-Normal Ch X & Y alarms; condenser off-gas radiation rises; letdown flow stops; S/G RC-2A level and pressure rise, feedwater flow decreases; RC-2A high level alarm; Rx trip; S/G blowdown monitor alarms; PPLS, SIAS, CIAS, and VIAS actuate with listed alarms and indications; PZR level rises due to SI flow, then backup heaters energize, RCS pressure rises to 1300 psia where leak flow and SI flow are balanced. Operator performs EOP-1 and S/G Tube Leak procedures.
Plant is recovered when plant conditions are stable and operator

unsuccessfully attempts to clear malfunction.

Test Status: 1 Date Completed: 4/19/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.30.2 Malfunction Identifier: SGN2

Test Description: Reference Leg Leak. A variable size leak occurs at the top of the selected reference leg(s).

Initial Conditions 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-D		Selection	A
Magnitude	0-100%	100% = 3/8" LINE BREAK	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: S/G RC-2A control channel level indicator level rises, feedwater regulating valve closes, reducing flow; RC-2A actual level decreases with low level alarm; RC-2A pressure drops with listed attendant alarms and Ch A ASGT trip; containment dew point and sump level rise.
Operator manually controls RC-2A level, bypasses S/G Pressure Trip A, observes bypass alarm annunciates and Low Pressure Trip alarm and trip lights clear; Ch A ASGT trip lights remain on.

Test Status: 1 Date Completed: 4/24/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.31.5 Malfunction Identifier: SIS5

Test Description: Safety Injection Tank Gas Space Leak. A variable size leak occurs from the gas space of the selected tank(s).

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-D		Selection	A
Magnitude	0-100%	100% = 1" DIAMETER HOLE	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: SI tank 6A pressure drops, SI-6A Hi-Lo Press, then at 243 psig SI-6A Lo Press alarms annunciate.

Test Status: 1 Date Completed: 1/25/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.32.3 Malfunction Identifier: GEN6

Test Description: Stator Cooling Water Pump Suction Line Leak.

Options Available:			Options Used:	
Selection	A,B		Selection	A
Magnitude	0-100%	100% = Double end suction shear	Magnitude	100%
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	D

Direct/Remote/Conditional

Test Parameters Monitored

T:T3235	Stator Cooling Inlet Temperature
T:T5028	Stator Cooling Outlet Temperature
T:T3234	Stator Winding Temperature
PTGAMU	Stator Cooling Water Pressure

Test Precis: Stator cooling pump 6A cavitates and trips; associated alarms annunciate. 70 seconds later, turbine and reactor trip.
Operator refers to AOP- and EOP-00.

Test Status: 2 Date Completed:
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.33.1 Malfunction Identifier: TUR1

Test Description: Main Turbine Lube Oil Reservoir Leak. A variable size leak occurs at the base of the main turbine lube oil reservoir.

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% = 1" LINE BREAK	Magnitude	N/A
Ramp Time	0-3600 s		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	N/A
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: bearing oil pressure decreasing, Turb Oil Tk Level HI-LO and Bearing Oil Press Low alarms; motor suction, emergency bearing, and turning gear oil pumps running with attendant alarms; after oil tank empties, oil pumps cavitate, then trip with attendant alarms; turbine vibration alarm and trip; turbine coasts down quickly. Operator follows EOP-01, Reactor Trip. Malfunction is non-recoverable.

Test Status: 2 Date Completed:
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.33.5 Malfunction Identifier: TUR5

Test Description: Main Turbine High Vibration. The selected bearing experiences excessive vibration of the magnitude selected.

Initial Conditions: 100% POWER, BOC, IC#14

Options Available:			Options Used:	
Selection	A-K		Selection	C
Magnitude	0-20 mil	100% = 20 mils	Magnitude	10m
Ramp Time	0-3600 s		Ramp Time	900 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, observe: turbine vibration alarm annunciates; vibration readings rise on bearings (highest to lowest) 3, 2, 4, 5, 1, and 6; turbine trip when vibration is > 10 mils; vibration decrease except through resonance speeds.
Plant is recovered when operator clears malfunction and observes vibration decreases to normal.

Test Status: 1 Date Completed: 2/21/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.33.6 Malfunction Identifier: TUR6

Test Description: Turning Gear Failure. The turning gear fails to engage when needed.

Initial Conditions: 0% POWER, IC#14, TURBINE OFF LINE, STEAM DUMP TO CONDENSER

Options Available:		Options Used:	
Selection	N/A	Selection	N/A
Magnitude	N/A	Magnitude	N/A
Ramp Time	N/A	Ramp Time	0 s
Delay Time	0-3600 s	Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

None

Test Precis:

Following malfunction actuation, Operator follows OI-ST-3, Turbine Generator Shutdown, observes bearing oil pressure stable and the turning gear oil pump starts. At 200 rpm, operator starts bearing lift pumps and observes listed normal indications. At 0 rpm, operator observes turning gear not started, then attempts manual start. Turning Gear Stopped or Disengaged alarm annunciates. After a long time turbine eccentricity increases.
Plant is recovered when operator clears malfunction, starts turning gear motor and observes alarm clears, then eccentricity decreases.

Test Status: 1 Date Completed: 4/20/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.34.2 Malfunction Identifier: WDS2

Test Description: Gas Decay Tank Leak. A variable size leak occurs on Gas Decay Tank B.

Initial Conditions: 100% POWER, BOC, IC#14, PPPWDS5 AT 10E5 CPM, LOA WD57 OPEN

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100%	100% ≈ 1.5" DIAMETER HOLE	Magnitude	100
Ramp Time	0-3600 s		Ramp Time	60 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Test Parameters Monitored:

RM060	Stack Gas Iodine Monitor
RM061	Stack Gas Air Particulate Monitor
RM062	Stack Gas High Rad Monitor
RM079	Area Rad Monitor - Gas Decay Tank Corr.

Test Precis:

Following malfunction actuation, observe: high activity indicated in the Main Stack with listed alarms, CRHS and VIAS actuations with listed actions and alarms; listed process monitor meters and recorders read high; listed containment stack monitor alarms and indications; corridor area monitors read high; tank WD-29B pressure decreased. Operator follows AOP-9, High Radioactivity, and AOP-29, Waste Gas Incident. After isolating tank and compressor rooms, observe radiation readings decrease.

Test Status: 2 Date Completed:
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

TROUBLE REPORT # / DESCRIPTION:

3987 / RMS recorders not working

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.35.1   Malfunction Identifier: MM1

Test Description: LOCA With LOSP And One EDG failure.

Initial Conditions: 100% POWER, BOC, IC#14

Malfunctions Used:

Selection	N/A	Selection	N/A
Magnitude	N/A 100% = N/A	Magnitude	N/A
Ramp Time	0-3600 s	Ramp Time	0 s
Delay Time	0-3600 s	Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

BRCMMGFN1	RC Vessel Mixture Level
BRCSPHC	Pzr Hot Calibrated Level
BSGNWR1	S/G A Wide Range Level
BSGNWR2	S/G B Wide Range Level
BSIS2904	SIT SI-6A Level
PRCMSTAR	RCS Global Pressure
PSGNS1	S/G A Steam Pressure
PSGNS2	S/G B Steam Pressure
T:T113	Loop 1A Cold Leg Wide Range
T:T123	Loop 2B Cold Leg Wide Range
TRCSWR2	Unknown Variable
TRCSWRH1	Wide Range Hot Leg Temp
TRXCCE	Core Exit Temp
TSMMMARG1	Unknown Variable
WAFWSGN1	Aux Feed Flow to Steam Generators
WAFWSGN2	Aux Feed Flow to Steam Generators

Test Precis:

1. Following malfunction actuation, observe: Rx trips, LOSP occurs, RCP's and Main Feedwater pumps trip, AFWS (except FW-6) actuates, Rx vessel head bubble forms, Hot Legs saturate, MSSV's open, SIAS actuates, PZR empties, DG-1 does not start.

2. HPSI flow begins from Train B. Rx core uncovers, then recovers. Operator follows EOP-20.

Test Status: 1   Date Completed: 4/03/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.35.2 Malfunction Identifier: MM2

Test Description: Inadvertent PORV Opening With LOSP And One EDG Failure.

Initial Conditions: 100% POWER, BOC, IC#14

Malfunctions Used:

Malfunction RCS25

Selection	N/A		Selection	N/A
Magnitude	100%	100% = Full Open	Magnitude	100%
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction DSG8A

Options Available:			Options Used:	
Selection	8A/8B		Selection	8A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction EDS-11A, EDS-11B, EDS-11C

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	C

Test Parameters Monitored:

BRCMMGFN1	RC Vessel Mixture Level
BRCS101Y	Pzr Level Channel Y
BSGNWR1	S/G A Wide Range Level
BSGNWR2	S/G B Wide Range Level
BSIS2904	SIT SI-6A Level
PRCMSTAR	RCS Global Pressure
PSGNS1	S/G A Steam Pressure
PSGNS2	S/G B Steam Pressure
T:907	Unknown Variable
T:F908	Steam Line B Steam Flow
T:T113	Loop 1A Cold Leg Wide Range
T:T123	Loop 2B Cold Leg Wide Range
TRCSWRH1	Wide Range Hot Leg Temp
TRCSWRH2	Wide Range Hot Leg Temp
TRXCCE	Core Exit Temp
TSMMMARG	Temperature Margin
WAFWSGN1	Aux Feed Flow to Steam Generators
WAFWSGN2	Aux Feed Flow to Steam Generators

Test Precis:

1. Following malfunction actuation, observe: PORV opens, Rx trips, LOSP occurs, RCP's and Main Feedwater pumps trip, MSSV's open, SIAS actuates, DG-1 does not start, HPSI flow from Train B starts, Hot Leg saturates, Rx Vessel head bubble forms, steam flow indicated through PORV, core remains covered.

2. Operator follows EOP-20 and does not take any action to isolate the PORV.

Test Status: 1 Date Completed: 4/03/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

ATP Test Number: 2[illegible] 5.5.35.3 **Malfunction Identifier:** MM3

Test Description: Inadvertent PORV Opening, LOFW (all), LOSP, Loss Of SI/ECCS

Initial Conditions: 100% POWER, BOC, IC#14

Malfunctions Used:

Malfunction RCS24

Options Available:			Options Used:	
Magnitude	100%	100% = FULL OPEN	Magnitude	100%
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	D

Direct/Remote/Conditional

Malfunction FDW1, FDW2, FDW3

Options Available:			Options Used:	
Selection	Tripped		Selection	Tripped
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	C

Direct/Remote/Conditional

Malfunction SIS4, SIS6

Options Available:			Options Used:	
Selection	Tripped		Selection	Tripped
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	D

Direct/Remote/Conditional

Malfunction ESF1, ESF2, ESF3, ESF4, ESF5, ESF6, ESF7, ESF8, ESF9, ESF10, ESF11, ESF12, ESF13

Options Available:			Options Used:	
Selection	A, B		Selection	A
Magnitude	T, F	100% = TRUE, FALSE	Magnitude	F
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	D

Direct/Remote/Conditional

Malfunction EDS-11A, EDS-11B, EDS-11C

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C		Mode	C

Direct/Remote/Conditional

Test Parameters Monitored:

BRCMMGFN1	RC Vessel Mixture Level
BRCSPHC	Pzr Hot Calibrated Level
BSGNWR1	S/G A Wide Range Level
BSGNWR2	S/G B Wide Range Level
BSIS2904	SIT SI-6A Level
PRCMSTAR	RCS Global Pressure
PSGNS1	S/G A Steam Pressure
PSGNS2	S/G B Steam Pressure
T:F907	Steam Line A Steam Flow
TRCSWRH1	Wide Range Hot Leg Temp
TRCSWRH2	Wide Range Hot Leg Temp
TRXCCE	Core Exit Temp
TSMMMARG	Temperature Margin
WAFWSGN1	Aux Feed Flow to Steam Generators
WAFWSGN2	Aux Feed Flow to Steam Generators

Test Precis:

1. Following malfunction actuation, observe: loss of Main Feedwater occurs, Rx and RCP's trip, MSSV's open, SIAS actuates, HPSI Train A flow starts, Rx Vessel head bubble forms, Hot Leg saturates, loss of natural circulation.

2. Operator follows EOP-20 and does not take any actions to isolate the PORV.

Test Status: 1 Date Completed: 4/22/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s)

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.35.4 Malfunction Identifier: MM4

Test Description: LOFW (all), LOSP, Failure Of One HPSI Pump And One ECCS Train.

Initial Conditions: 100% POWER, BOC, IC#14

Malfunctions Used:

Malfunction FDW1

Options Available:

Selection Tripped

Magnitude N/A 100% = N/A

Ramp Time N/A

Delay Time 0-3600 s

Mode D, R, or C
Direct/Remote/Conditional

Options Used:

Selection Tripped

Magnitude N/A

Ramp Time N/A

Delay Time 0 s

Mode D

Malfunction FDW2, FDW3

Options Available:

Selection Tripped

Magnitude N/A 100% = N/A

Ramp Time N/A

Delay Time 0-3600 s

Mode D, R, or C
Direct/Remote/Conditional

Options Used:

Selection Tripped

Magnitude N/A

Ramp Time N/A

Delay Time 0 s

Mode C

Malfunction AFW1, AFW2

Options Available:

Selection Tripped

Magnitude N/A 100% = N/A

Ramp Time N/A

Delay Time 0-3600 s

Mode D, R, or C
Direct/Remote/Conditional

Options Used:

Selection Tripped

Magnitude N/A

Ramp Time N/A

Delay Time 0 s

Mode D

Malfunction SIS5

Options Available:			Options Used:	
Selection	Tripped		Selection	Tripped
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction ESF1, ESF2, ESF3, ESF4, ESF5, ESF6, ESF7, ESF8, ESF9, ESF10, ESF11, ESF12

Options Available:			Options Used:	
Selection	A, B	A=TRAIN A, B=TRAIN B	Selection	B
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction EDS-11A, EDS-11B, EDS-11C

Options Available:			Options Used:	
Selection	FAULT		Selection	FAULT
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	C

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.35.4 Malfunction Identifier: MM4

Test Description: LOFW (all), LOSP, Failure Of One HPSI Pump And One ECCS Train.

Initial Conditions: 100% POWER, BOC, IC#14

Malfunctions Used:

Malfunction FDW1

Options Available:			Options Used:	
Selection	Tripped		Selection	Tripped
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction FDW2, FDW3

Options Available:			Options Used:	
Selection	Tripped		Selection	Tripped
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	C

Malfunction AFW1, AFW2

Options Available:			Options Used:	
Selection	Tripped		Selection	Tripped
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction SIS5

Options Available:			Options Used:	
Selection	Tripped		Selection	Tripped
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction ESF1, ESF2, ESF3, ESF4, ESF5, ESF6, ESF7, ESF8, ESF9, ESF10, ESF11, ESF12

Options Available:			Options Used:	
Selection	A, B	A=TRAIN A, B=TRAIN B	Selection	B
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction EDS-11A, EDS-11B, EDS-11C

Options Available:			Options Used:	
Selection	FAULT		Selection	FAULT
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	C

Test Parameters Monitored:

BRCMMGFN1	RC Vessel Mixture Level
BRCSPHC	Pzr Hot Calibrated Level
BSGNWR1	S/G A Wide Range Level
BSIS2904	SIT SI-6A Level
PRCMSTAR	RCS Global Pressure
PSGNS1	S/G A Steam Pressure
PSGNS2	S/G B Steam Pressure
TRCSWRH1	Wide Range Hot Leg Temp
TRCSWRH2	Wide Range Hot Leg Temp
TRXCCE	Core Exit Temp
TSMMMARG	Temperature Margin
WAFWSGN1	Aux Feed Flow to Steam Generators
WAFWSGN2	Aux Feed Flow to Steam Generators
WRCSAFT	Safety Line Flow
WRCSPORV	PCV-102-1/2 Flow

Test Precis:

1. Following malfunction actuation, observe: loss of Main Feedwater, Rx and RCP's trip, MSSV's and PORV's open, Hot Leg reaches saturation. Operator follows EOP-06.

2. Plant is recovered when operator restarts charging, TPCW, air compressors, CCW and RW Cooling.

Test Status: 1 Date Completed: 4/22/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
MALFUNCTION TEST

OPPD Test Number: 14.5.5.35.5 Malfunction Identifier: MM5

Test Description: LOCA With 1 S/G Isolated, LOSP, 1 EDG Failure.

Initial Conditions: 100% POWER, BOC, IC#14

Malfunctions Used:

Malfunction RCS1C

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	100%	100% = 24 inch	Magnitude	2.75%
Ramp Time	0-3600 s		Ramp Time	10 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction SGN12

Options Available:			Options Used:	
Selection	As Is/Position		Selection	Position
Magnitude	0-100	0-Closed, 100-Open	Magnitude	0
Ramp Time	0-3600 s		Ramp Time	0 s
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	C

Malfunction AFW2

Options Available:			Options Used:	
Selection	As Is/Position		Selection	Position
Magnitude	0-100	0-Closed, 100-Open	Magnitude	0
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction EDS-11A, EDS-11B, EDS-11C

Options Available:			Options Used:	
Selection	FAULT		Selection	FAULT
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	C

Malfunction DSG8A

Options Available:			Options Used:	
Selection	8A/8B		Selection	8A
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction AFW1

Options Available:			Options Used:	
Selection	Tripped		Selection	Tripped
Magnitude	N/A	100% = N/A	Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C Direct/Remote/Conditional		Mode	D

Malfunction AFW12

Options Available:			Options Used:	
Selection	N/A		Selection	N/A
Magnitude	0-100	0-Closed, 100-Open	Magnitude	0
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Malfunction CVC3, CVC4, CVC5

Options Available:			Options Used:	
Selection	Tripped		Selection	Tripped
Magnitude	N/A		Magnitude	N/A
Ramp Time	N/A		Ramp Time	N/A
Delay Time	0-3600 s		Delay Time	0 s
Mode	D, R, or C	Direct/Remote/Conditional	Mode	D

Test Parameters Monitored:

BRCMMGFN1	RC Vessel Mixture Level
BSGNWR1	S/G A Wide Range Level
BSGNWR2	S/G B Wide Range Level
BSIS2904	SIT SI-6A Level
PRCMSTAR	RCS Global Pressure
PSGNS1	S/G A Steam Pressure
PSGNS2	S/G B Steam Pressure
T:F907	Steam Line A Steam Flow
T:T113	Loop 1A Cold Leg Wide Range
T:T123	Loop 2B Cold Leg Wide Range
T:T908	Unknown Variable
TRCSWR2	Unknown Variable
TRXCCE	Core Exit Temp
TSMMMARG1	Unknown Variable
WAFWSGN1	Aux Feed Flow to Steam Generators
WAFWSGN2	Aux Feed Flow to Steam Generators

Test Precis:

1. Following malfunction actuation, observe: S/G 2 MSSV's open, Rx trips, LOSP, RCP's and Main Feedwater pumps trip, S/G 1 MSIV closes, S/G 1 MSSV's open, SIAS actuates, Rx Vessel head bubble forms, HPSI flow starts, PZR empties, core does not uncover.

Test Status: 1 Date Completed: 4/22/90
1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

APPENDIX 3.A

OTHER TESTS

INDEX OF OTHER TESTS

TEST NO.	TEST NAME	DESCRIPTION
14.2.1	Panel visual inspection	OPPD hardware inspections.
14.2.2	Verification of instrumentation scales	Verifies that the simulator control board panel instrument faceplate scales match the FCS Unit 1 boards.
14.2.3	Verification of nameplate and annunciator engraving	Verifies that the simulator control boards match the FCS Unit 1 control boards.
14.4.4	Electrical bus tests	Verifies that the simulated plant electrical bus loads are connected to the correct bus.
14.5.5	Plant air tests	Verifies that simulated air supplied components are connected to the correct air header.
14.5.1.1.1	Reactor coolant system testing	Verifies that operator conducted surveillance testing can be performed on the reactor coolant system.
14.5.1.1.4	Chemical and volume control system testing	Verifies that operator conducted surveillance testing can be performed on the chemical and volume control system.
14.5.1.1.5	Safety injection system testing	Verifies that the operator conducted surveillance testing can be performed on the safety injection system.
14.5.1.1.6	Component cooling water system testing	Verifies that the operator conducted surveillance testing can be performed on the component cooling water system.
14.5.1.1.16	Auxiliary feedwater system testing	Verifies that the operator conducted surveillance testing can be performed on the auxiliary feedwater system.
14.5.1.1.17	Raw water system testing	Verifies that the operator conducted surveillance testing can be performed on the raw water system.
14.5.1.2.1	Reactor core testing	Verifies that the operator conducted surveillance testing can be performed on the reactor core.
14.5.1.2.2	Control rod drive system testing	Verifies that the operator conducted surveillance testing can be performed on the control rod drive mechanism system.

INDEX OF OTHER TESTS

TEST NO.	TEST NAME	DESCRIPTION
14.5.1.2.5	Containment ventilation system testing	Verifies that the operator conducted surveillance testing can be performed on the containment ventilation system.
14.5.1.2.9	Diesel generating system testing	Verifies that the operator conducted surveillance testing can be performed on the diesel generating system.
14.5.1.2.10	Inplant electrical distribution system testing	Verifies that the operator conducted surveillance testing can be performed on the inplant electrical distribution system.
14.5.1.2.12	Diesel generator sequencer testing	Verifies that the operator conducted surveillance testing can be performed on the diesel generator sequencers.
14.5.1.2.15	Reactor protective system testing	Verifies that the operator conducted surveillance testing can be performed on the reactor protective system.
14.5.1.2.16	Engineered safeguards system testing	Verifies that the operator conducted surveillance testing can be performed on the engineered safeguards system.
14.5.1.2.17	Nuclear instrumentation system testing	Verifies that the operator conducted surveillance testing can be performed on the nuclear instrumentation system.
14.5.1.2.18	Incore nuclear instrumentation testing	Verifies that the operator conducted surveillance testing can be performed on the incore nuclear instrumentation.
14.5.2.1	Rod worth tests	Verifies the simulator's core physics calcul[illegible] of banked rod worths as ma[illegible], FCS Unit 1 data over core age.
14.5.2.2	Boron worth tests	Verifies the simulator's core physics calculations of boron worth at differing core ages correspond to FCS Unit 1 data for the same conditions.
14.5.2.3	Isothermal temperature coefficient test	Verifies the simulator's core physics calculations for the isothermal temperature coefficient correspond FCS Unit core physics data.

INDEX OF OTHER TESTS

TEST NO.	TEST NAME	DESCRIPTION
14.5.2.4	Power coefficient test	Verifies the simulator's core physics calculations for the power coefficient correspond to FCS Unit 1 core physics data.
14.5.2.5	Xenon tests	Verifies the simulator's core physics calculations for Xenon correspond to FCS Unit 1 core physics data.
14.5.2.6	Estimated critical position tests	Verifies the simulator's integration of core physics data, and that the FCS estimated critical position procedure can be used.
14.5.6.1	Emergency auxiliary feedwater panel test	Verifies the ability of the simulator to allow operation of the emergency auxiliary feedwater panel in a realistic fashion.
14.5.6.2	Alternate shutdown panel test	Verifies the ability of the simulator to allow operation of the alternate shutdown panel.
14.5.6.3	Neutron monitoring panel test	Verifies the ability of the simulator to allow operation of the neutron monitoring panel in a realistic fashion.
14.5.6.4	D-2 diesel generator and engine control panel test	Verifies the ability of the simulator to model Appendix R requirements for control room fire isolation criteria on diesel generator 2.
14.5.7	Initial condition checklist	Documents the parameter readings used by the simulator for the protected initial condition set.

PERFORMANCE TEST ABSTRACT
HARDWARE TEST

Test Number: 14.2.1

Test Name: PANEL VISUAL INSPECTION

Description: This test documents OPPD hardware inspections.

Test Precis: An inspection of each shipped section of simulator panels and hardware was performed. Fabrication, paint and wiring was checked as satisfactory. The type and number of power supplies, and input/output cards were checked.

Test Status: 1 Date Completed: 3/06/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
HARDWARE TEST

Test Number: 14.2.2

Test Name: VERIFICATION OF INSTRUMENTATION SCALES

Description: This test verified that the simulator control board panel instrument faceplate scales match the FCS Unit 1 boards.

Test Precis: A comparison was made between "as installed" simulator instrumentation scales and controlled OPPD approved instrument scale sheet documents. Discrepancies were noted and are being resolved.

Baseline: OPPD Acceptance Test Plan, Approved Instrument Scale Sheets, OP-4032 and 4033

Test Status: 2 Date completed: future

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

Trouble Report, # / Description:

2410 / RM PANELS METER SCALE DATA SHEETS

PERFORMANCE TEST ABSTRACT
HARDWARE TEST

Test Number: 14.2.3

Test Name: VERIFICATION OF NAMEPLATE AND ANNUNCIATOR ENGRAVING

Description: This test verified that the simulator control boards match the FCS Unit 1 control boards.

Test Precis: Comparison checks were made between as installed simulator control boards and FCS Unit 1 boards.

Panel hand switch engraving, labeling, mimics, demarcation, color padding and annunciator engraving were checked to verify physical fidelity with Unit 1. Discrepancies were noted and are being resolved.

Baseline: Control Room Design Review, MR FC 88-22

Test Status: 2 Date completed: future

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

Trouble Report, # / Description

2046 / LABEL DISCREPANCIES FOR PANEL CB-1,2,3
2047 / LABEL DISCREPANCIES FOR PANEL CB-10,11
2048 / LABEL DISCREPANCIES FOR PANEL CB-20
2049 / LABEL DISCREPANCIES FOR PANEL CB-4
2051 / LABEL DISCREPANCIES FOR PANEL AI-54A
2052 / LABEL DISCREPANCIES FOR PANEL AI-65A/B AND 66A/B
2054 / LABEL DISCREPANCIES FOR PANEL AI-44
2055 / LABEL DISCREPANCIES FOR PANEL AI-43A AND AI-43B
2056 / LABEL DISCREPANCIES FOR PANEL AI-30A (D1)
2057 / LABEL DISCREPANCIES FOR PANEL AI-42A AND AI-42B
2061 / LABEL DISCREPANCIES FOR PANEL AI-45
2062 / LABEL DISCREPANCIES FOR PANEL AI-30B (D2)
2063 / LABEL DISCREPANCIES FOR PANEL AI-33A,33B,33C

PERFORMANCE TEST ABSTRACT
HARDWARE TEST

Test Number: 14.2.3

Trouble Report, # / Description

2064 / LABEL DISCREPANCIES FOR PANEL AI-31A,B,C,D,E
2067 / LABEL DISCREPANCIES FOR PANEL AI-128B
2069 / LABEL DISCREPANCIES FOR PANEL AI-179
2070 / LABEL DISCREPANCIES FOR PANEL AI-185

PERFORMANCE TEST ABSTRACT
ELECTRICAL BUS & AIR PLANT TESTS

Test Number: 14.4.4

Test Name: ELECTRICAL BUS TESTS

Description: This test verifies that the simulated plant electrical bus loads are connected to the correct bus.

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: Simulator electrical distribution calculations were verified correct thru the following methods. A database inspection was performed, and verified that all bus loads were connected to the correct bus.

The simulator was then run, each bus was in turn deenergized, and verified that the components supplied by that bus were verified to have deenergized by spot checking the loads.

Baseline: FCS Electrical Load Studies for 4160, 480 and 120 VAC and 125 VDC busses.
Technical Data Book V.11, Operating Instructions OI-EE-2,3 & 4.

Test Status: 2 Date completed: future

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

Trouble Report, # / Description - future

PERFORMANCE TEST ABSTRACT
ELECTRICAL BUS & AIR PLANT TESTS

Test Number: 14.4.5

Test Name: PLANT AIR TESTS

Description: This test verifies that simulated air supplied components are connected to the correct air header.

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: Simulator air supply calculations were verified correct thru the following methods. A database inspection was performed, and verified that all air loads were connected to the correct header.

The simulator was then run, each air header was in turn depressurized and verified that the components supplied by that header were verified to go to their failed position by spot checking the loads.

Baseline: FCS Instrument Air and Compressed Air Diagrams 11405-M-263 and 264, OPPD Acceptance Test Plan, Loss of Instrument Air Abnormal Operating Procedure, AOP-17, Compressed Air DBD 103.10, and the Simulator Data Base.

Test Status: 2 Date completed: future

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

Trouble Report, # / Description - future

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.1

Test Name: REACTOR COOLANT SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Reactor Coolant System (RCS), the following surveillances were performed:

Pressurizer Level Instruments
PORV Block Valves Operation
Low Temperature-Low Pressure PORV System
RCS Leak Rate Test
Subcooled Margin Monitor

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: The Pressurizer (Pzr.) Level Instruments surveillance tested the redundant Pzr. Level Control channel signals.

By varying the Pzr. Level Transmitter signal, a check of start and stop signals for the charging pumps, on and off signals for the Pzr. Proportional and Backup Heaters, LOW, LO-LO, HIGH and HI-HI alarm setpoints and resets was performed. Train separation was tested by verifying that the controlled system responded to only the tested signal.

The PORV Block valve test stroked each PORVs Block valve, and verified the proper operation and position indication of the valves.

The Low Temperature-Low Pressure PORV test was conducted by verifying the logic circuit indicators were enabled and the appropriate annunciators actuated.

The RCS Leak Rate testing used two differing methods. The first test was a normal Leak Rate calculation performed by the Emergency Response Facilities Computer System. For the second method, data was gathered from Control Board instruments and a water inventory balance performed.

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.1

Test Precis: (cont.)

The Sub Cooled Margin Monitor surveillance tested the A & B Subcooled Monitors and the A & B channel Qualified Safety Parameter Display System (QSPDS) calculations of P_{sat}, T_{sat} and margins, to correspond to saturated steam table calculations for RCS conditions.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Procedures for the RCS.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline:
Pressurizer Level Instruments - ST-PL-1-1
PORV Block valve - ST-PORV-2-1
Low Temperature-Low Pressure PORV - MST-PORV-1-1
RCS Leak Rate - ST-RLT-3-1
Sub Cooled Margin Monitor - ST-SMM-1

Test Status: 1 Date completed: 5/19/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.4

Test Name: CHEMICAL AND VOLUME CONTROL SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Chemical and Volume Control System (CVCS), the CVCS Valves In-Service Testing surveillance was performed.

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: Various CVCS Containment Isolation, Safety Grade and Control Grade Valves were time stroked shut and compared to FCS Unit 1 Stroke Time criteria.

Nomenclature of the valves tested follows:

Train A Boric Acid Pump Recirc Flow Control Valve
Train B Boric Acid Pump Recirc Flow Control Valve
Charging Control Valve to Loop 1A (2 valves)
Charging Control Valve to Loop 2A (2 valves)
Makeup to Volume Control Tank Flow Control Valve
Volume Control Tank Inlet Diversion Valve
Train A to Train B Boric Acid Tank Outlet Control Valve
Train B to Train A Boric Acid Tank Outlet Control Valve
Reactor Coolant Pump Bleed-Off Inside Containment Isolation Valve (2 valves)
Letdown Regen Hx Temperature Control Inside Containment Stop Valve
Letdown Outside Containment Stop Valve
Volume Control Tank Outlet Valve
Auxiliary Pzr. Spray Control Valve (2 valves)
Unfiltered Boric Acid to Charging Pump Header Control Valve

Flow test of the following was performed:

Boric Acid to Charging Pump Suction Header Check Valve
Gravity Feed Header to Charging Pump Suction Check Valve

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.4

Test Precis: (cont.)

Valve Lineup test of the following were performed:

Train A Boric Acid Pump Discharge Check Valve
Train B Boric Acid Pump Discharge Check Valve

The results of the above surveillance showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Inservice Surveillance Test for the CVCS.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Chemical and Volume Control Valves In-Service Testing, ST-ISI-CVCS-1

Test Status: 1 Date completed: 1/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.5

Test Name: SAFETY INJECTION SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Safety Injection System (SIS), the following surveillances were performed:

Safety Injection Valves In-Service Testing
SI/CS Pumps and Valves
Shutdown Cooling Valve Interlock Test

Initial Conditions:

IC-14	BOC, 100% Power, Equil Xenon
IC-01	BOC Cold Shutdown-RCS drained
IC-06	BOC RCS Hot Shutdown - Borated

Test Precis: For the Safety Injection Valves In-Service refueling interval test, Category A, B, and C Safety Related Safety Injection valves were time stroked to verify operability. Valve stroke times were verified to be within the allowable band.

The SI/CS Pumps and Valves quarterly test was performed. Safety Related valves were time stroked to verify operability. High and Low Pressure Safety Injection Pump inservice inspections were performed on all SI pumps. SI Tank Check Valve refueling check was performed by draining 1% level from each SIT, and verifying pressure and level decrease.

The Shutdown Cooling (SDC), Valve Interlock refueling test was performed. SDC suction valve controls, annunciators, automatic actions and overrides were tested and verified to actuate in response to varying the Pressure Transmitter inputs.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for SIS.

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.5

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Safety Injection Valves In-Service Testing, ST-ISI-SI-1
SI/CS Pumps and Valves, ST-SI/CS-1
Shutdown Cooling Valve Interlock Test, ST-SDC-1

Test Status: 1 Date completed: 3/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.6

Test Name: COMPONENT COOLING WATER SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Component Cooling Water System (CCW), the CCW Pump Inservice Test surveillance was performed.

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: CCW Pump AC-3A was run for an inservice inspection. CCW Pump AC-3B and 3C were verified off.

The pump was run for five minutes, then suction and discharge pressure, and indicated pump flow rate were recorded. Total pump head was calculated, and compared to FCS Unit 1 Head vs. Flow Pump Curve for that pump.

Acceptance flowrate criteria also showed that the other 2 CCW pump discharge check valves were shut and operable. Pumps AC-3B and AC-3C were tested in the same fashion.

The results of the above surveillance showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Inservice Surveillance Test for CCW.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Component Cooling Water Pump Inservice Testing, ST-ISI-CC-3

Test Status: 1 Date completed: 1/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.16

Test Name: AUXILIARY FEEDWATER SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Auxiliary Feedwater System (AFW), the following surveillances were performed:

Auxiliary Feedwater Pumps Inservice Inspection
Auto Initiation of Auxiliary Feedwater

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon
IC-01 BOC, Cold Shutdown - RCS Drained

Test Precis: AFW Motor Driven Pump FW-6 and Turbine Driven Pump FW-10 were run for an inservice inspection.

The pumps were run on miniflow for ten minutes, then suction and discharge pressures, and pump flow rates were recorded. Total pump head was determined to be at least 92 psig greater than Steam Generator pressure. Amps for FW-6 and Steam Inlet Valve stroke time for FW-10 were verified within specification.

Steam Generators RC-2A and RC-2B, AFW Initiation and Override Logic Testing was performed. AFW flow was blocked from entering the Generators.

All logic matrices were then tested, with A-B, A-C, A-D, C-D, B-D and B-C in turn given low level signals. In each matrix, the actuation alarm, Emergency Safeguards Feature indicating lamp and matrix actuation relays were verified to actuate and reset

The AFW System Functional refueling interval test of initiation and control circuits was performed in a Cold Shutdown mode, so Steam Driven FW-10 was not tested.

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.16

Test Precis: (cont.)

Functional testing verified AFW valves opened, Pump starts, and AFW flow to the S/Gs. Emergency Safeguards Features Actuation System logic lamps and annunciators were verified to actuate. Operator overrides and reset of the initiation were verified.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for AFW.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Auxiliary Feedwater, ST-FW-1
Auto Initiation of Auxiliary Feedwater, ST-FW-3

Test Status: 1 Date completed: 1/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT FLUID SYSTEM TESTS

Test Number: 14.5.1.1.17

Test Name: RAW WATER SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Raw Water System (RWS), the following surveillances were performed:

Raw Water System Valve Actuation
Raw Water Valves Inservice Testing

Initial Conditions:

IC-02 BOC, Cold Shutdown - Pzr Bubble

Test Precis: The Raw Water System Valve Actuation refueling test was performed. This test verified an ability to isolate any portion of the RWS from the Control Room, and verified the operability of all Raw Water Backup valves.

The Raw Water Valves Inservice quarterly test was performed. This test performed a time stroke of RWS Category A and B valves. Category C check valves were flow tested.

The Raw Water Inservice Pump monthly test was performed. Pump differential pressures, amps and check valve operabilities was verified.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for AFW.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Raw Water System Valve Actuation ST-RWS-1
Raw Water Valves Inservice Testing ST-ISI-RW-1

Test Status: 1 Date completed: 1/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.1

Test Name: REACTOR CORE TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Reactor Core, the Reactivity Anomalies surveillance was performed.

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: This test analyzed for reactivity deviations by performing a reactivity balance. The balance was a comparison of the excess reactivity available from fuel to the reactivity from rods, xenon, samarium, boron, temperature, and power.

The test begins with collecting Reactor power, CEA group positions, Boron concentration, and average core burnup data.

Excess fuel reactivity was predicted using the Technical Data Book (TDB).

Inserted Rod worth, Boron, Xenon, Samarium and Power Defect (Fuel Defect + Moderator Defect), were calculated or determined using the TDB.

The summation of negative reactivity was performed and was equal to measured excess fuel reactivity.

The deviation between the measured excess reactivity and the predicted excess reactivity was determined. The deviation was then determined to be within the acceptance criteria.

Testing continued by performing a Boron deviation analysis. Predicted Boron concentration was determined from the TDB. A reactor power weighted, soluble boron correction factor was determined from the TDB, and applied to actual boron concentration.
The deviation between Predicted Critical Boron and corrected Boron concentration was determined. The deviation was then determined to be within the acceptance criteria.

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.1

Test Precis: (cont.)

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for the Reactor Core.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Reactivity Anomalies Surveillance, ST-RA-1
FCS Technical Data Book

Test Status: 1 Date completed: 1/7/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.2

Test Name: CONTROL ROD DRIVE SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Control Rod Drive Mechanism System (CRDM), the following surveillances were performed:

Control Element Assemblies
Secondary CEA Position Indicating, Interlocks, Alarms, and Display System

Initial Conditions:

IC-06 BOC, RCS Hot Shutdown, Borated

Test Precis: The Control Element Assemblies (CEAs) test verified the CEA Drive System Interlocks, and Alarms.

The Regulating Group Withdrawal Prohibit, Shutdown Group Insertion Permissive, and Regulating Group Upper and Lower Sequential Permissives, were tested using in Manual Group, and Manual Sequential, control modes for trippable and non-trippable CEAs.
Each Train of the Reactor Protective System (RPS) Rod Rundown Relays was manually energized and verified to insert and stop insertion of all full length CEAs.

The RPS (2/4) High Power and High Startup Rate Pre-Trip Rod Withdrawal Prohibit was tested to prohibit outward CEA movement in both Manual Individual and Manual Group mode control. Reset of the Withdrawal Prohibit was tested.

A Reactor Trip test was performed to verify all full length CEAs inserted.

The simulator was then initialized to IC-14, 100% Power, Equil. Xenon.

The shiftly Regulating CEA Groups/Transient Insertion Limits Check was performed by verifying that PDIL alarms were not in alarm.

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.2

Test Precis: (cont.)

The daily Regulating CEA Groups/Long Term Insertion Limit Check was performed using the plant computer to verify CEA positions were greater than the Transient Insertion limit for 100% Power. An Effective Full Power Day calculation was also performed.

The bi-weekly Manual Individual exercise of CEAs was performed by inserting and withdrawing each Reg Group and S/D CEA 6 inches.

The monthly Plant Computer Power Dependant Insertion Limits (PDIL), Deviation, and Sequence Monitoring System test was performed. Permissives and alarms associated with CEA movement, deviation, Pre-PDIL, PDIL were verified. CEA mimic board status lamp checks were verified. Permissive and alarm setpoints were verified to correlate to expected setpoints within the allowable band.

The Secondary CEA Position Indicating System, PDIL, Deviation, Out Of Sequence, and Overlap Monitoring System Test was performed. A temporary keyboard was attached to the Secondary CEA Position Indicating System (SCEAPIS) keypad.

Regulating Group 1 insertion below PDIL was simulated, with Pre-PDIL, PDIL and Rod Block annunciators verified to actuate. MI control of CEAs was verified blocked, then the Rod Block Bypass was verified by CEA movement in MI.

CEA deviation in S/D Group A, Out of Sequence /Overlap for Reg Group 3, their annunciators, Rod Block and Bypass testing was performed.

CEA Group Indication Light Check and CEA Drop Time testing was performed with the simulator at IC-06, BOC, RCS Hot Shutdown, Borated, All Rods In. Each trippable CEA was individually withdrawn to the Upper Electrical Limit (126"), with control, reed switch, and indication lamps verified to function.

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.2

Test Precis: (cont.)

Power to that CEA was interrupted in accordance with OI-ERFCS-1, and the insertion was timed to 90% inserted. Initial and Final Synchro readings were verified to match. Rod Drop times were verified to be within allowable bands.

Secondary CEA Position Indicating, Interlocks, Alarms, and Display System testing was performed. This test used the SCEAPIS temporary keyboard.

Single CEA Deviation, Regulating Group Withdrawal Prohibit, Shutdown Group Insertion Permissive, Group Out Of Sequence, and Overlap, permissives, annunciators and setpoints were tested.

Rod Block and Override was functionally tested for Single CEA Deviation, Regulating Group Out Of Sequence, Overlap and Regulating Group insertion to PDIL. Pre-PDIL and PDIL annunciators and interlocks for different configurations were tested.

Using MI control, each CEA was fully withdrawn and inserted with Primary, Secondary, and Synchro, position crosschecks performed.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for the CRDM System.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Control Element Assemblies, ST-CEA-1
Secondary CEA Position Indicating, Interlocks, Alarms, and Display System, ST-SCEAPIS-1

Test Status: 1 Date completed: 5/19/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.5

Test Name: CONTAINMENT VENTILATION SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Containment Ventilation System, the following surveillances were performed:

Containment Air Cooling and Filtering System
Containment Hydrogen Monitors
Ventilating Air Valves Inservice Testing

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: Containment Emergency Air Cooling Units were run, with the operational check of Cooling Unit Dampers performed. Fan amperages and Damper strokes were satisfactory.

Containment Hydrogen monitors were placed in service and the readings were crosschecked to be within the allowable band.

Containment Pressure Relief Valves were time stroked shut, and closing times were verified to be within the allowable band.

Containment Radiation Monitor Isolation Valves were time stroked shut and closing times were verified to be within the allowable band.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Containment Air Cooling and Filtering System, ST-VA-1
Containment Hydrogen Monitors, ST-VA-6
Ventilating Air Valves Inservice Testing, ST-ISI-VA-1

Test Status: 1 Date completed: 3/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.9

Test Name: DIESEL GENERATING SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Diesel Generating System, the Diesel Start and Diesel Fuel Oil Transfer Pump surveillance was performed.

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: The Emergency Diesel Generators responses to auto starts were tested. Slow speed starts, with the governor set to idle speed followed by raise to full speed, were performed. Fast speed starts, with the Diesel going immediately to full speed were tested. Both types were followed by loading to full power.

An operational check of both Diesels was performed. A slow speed manual start, with data recorded for governor minimum and maximum speed, minimum and maximum voltage, followed by shutdown, Emergency restart and 2 hour full load run, was performed.

A slow speed, timed, manually initiated auto start, of Emergency Diesel DG-1 to idle speed was performed, followed by synchronization and loading to full rated load on its 1E Bus. Electrical parameters were monitored on the ERF computer system, with Diesel parameters, ie. cooling water and oil, temperatures and pressures manually recorded. Fuel oil transfer pumps operability was verified. The Diesel was unloaded, removed from the bus, stopped, then returned to auto standby.

Emergency Diesel DG-2 was tested in the same fashion.

Diesel Generator monthly fast speed auto starts were tested in a similar fashion for each Generator. For this surveillance, a one hour full load run and a Diesel HVAC dampers timed stroke was performed.

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.9

Test Precis: (cont.)

The Refueling Interval Surveillance was performed. A functional Loss of Offsite Voltage test with DG-1 response, with concurrent Pressurizer Pressure Low, Safety Injection, Containment Isolation, Ventilation Isolation Actuation and Safeguards Equipment Loading was performed.

Load Shed, Sequencing, Control Circuits, Safeguards Loads, Safety Injection flowrates, and PORV operabilities were verified. Offsite power was returned to service and Safeguards loads were transferred from the Diesel. DG-1 was returned to standby.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for the Emergency Diesel System.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Diesel Start and Diesel Fuel Oil Transfer Pump, ST-ESF-6-1

Test Status: 1 Date completed: 3/4/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ADSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.10

Test Name: INPLANT ELECTRICAL DISTRIBUTION SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Inplant Electrical Distribution System, the following surveillances were performed:

13.8 KV Emergency Power
D.C. Transfer Switches

Initial Conditions:

IC-01 BOC Cold Shutdown - RCS drained

Test Precis: This test verified that 13.8 KV Emergency Power was capable of performing its design function following the simultaneous loss of 345 KV, and 161 KV, off-site AC power and the failure of both on-site Diesel Generators (ie. limited Station Blackout).

Breakers from the Control Room and Turbine Building were opened and power was isolated to the site. The 13.8 KV transformer and feeds were then verified capable of carrying Boric Acid Heat Tracing, Pressurizer Backup Heater Bank No. 2, Charging Pump CH-1B, and Battery Charger No. 3 loads. Battery Charger 3 is capable of alternately charging DC Busses 1 or 2 and was selected to charge DC Bus 1.

D.C. Transfer Switches testing verified the proper transfer from the normal to emergency power supply for transferrable inplant 125 V.D.C. control busses.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for the Inplant Electrical Distribution System.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: 13.8 KV Emergency Power, ST-ED-1
D.C. Transfer Switches, ST-DC-3

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.10

Test Status: 1 Date completed: 3/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.12

Test Name: DIESEL GENERATOR SEQUENCER TESTING

Description: To verify that operator conducted surveillance testing can be performed on the D.G. Sequencers, the Automatic Load Sequencers surveillance was performed.

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: This test verified the AC and DC Engineered Safeguards Load Sequencer circuits and time setpoints. The ERF computer was used to capture the sequence of events to the equipment receiving a timer operate signal. Testing was performed by inhibiting operation of equipment with Sequencer S1-2 Isolation Switches, placing the Sequencer Auto Start Test Switch to Test, and verifying Sequencer Lockout Relay trip. Safeguards Equipment for that train was verified to have received a start signal. The Sequencer Lockout Relays were reset and Sequencer Timers were verified to reset. Equipment start inhibition was removed and auto standby indications were verified. Actuation signal times were verified to be within the allowable band.

Sequencer S2-2 for Train B was tested in the same fashion.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for the D.G Sequencers.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Automatic Load Sequencers, ST-ESF-5

Test Status: 1 Date completed: 1/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.15

Test Name: REACTOR PROTECTIVE SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Reactor Protective System (RPS), the following surveillances were performed:

RPS Normal Operation
RPS Thermal Margin/Low Pressure/T_{cold}
Reactor Coolant Flow
Thermal Margin/Low Pressure Channels
High Pressurizer Pressure Channels
Steam Generator Level Channels
Steam Generator Pressure Channels
High Containment Pressure Channels
Turbine Loss of Load Channels
Manual Trip Channels
RPS Logic Units
Axial Power Distribution Channels

Initial Conditions:

IC-14	BOC, 100% Power, Equil Xenon
IC-01	BOC Cold Shutdown - RCS Drained
IC-06	BOC RCS Hot Shutdown - Borated

Test Precis: RPS Normal Operation performed a switch alignment and lamp illumination verification.

The Thermal Margin/Low Pressure/T_{cold}, daily channel check and calibration, was performed. This test ensured the four RPS channels T_{cold} were in the allowable band.

The Reactor Coolant Low Flow, monthly alarm and trip channel check was performed. This test verified the four RPS channel's RCS Low Flow Pre-trip and Trip logic actions, and annunciator setpoints for 4 pump operation to be in the allowable band.

The Thermal Margin/Low Pressure Channels, monthly alarm and trip channel check and calibration, was performed.

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.15

Test Precis: (cont.)

Calculations using Delta T Power, Nuclear Power, T cold cal, Internal Tilt, and correction factors, were performed for each channel and installed. Testing verified the four RPS channel's Thermal Margin Pre-trip and Trip logic actions, and annunciator setpoints to be in the allowable band.

The High Pressurizer Pressure Channels, monthly alarm and trip channel check, was performed. This test verified the four RPS channel's High Pressurizer Pressure Pre-trip and Trip logic actions, and annunciator setpoints to be in the allowable band.

The Steam Generator Level Channels, monthly alarm and trip channel check, was performed. This test verified the four RPS channel's for each Steam Generator's Level Low Pre-trip and Trip logic actions, and annunciator setpoints to be in the allowable band.

The Steam Generator Pressure Channels, monthly alarm and trip channel check, was performed. This test verified the four RPS channel's for each Steam Generator's Pressure and Asymmetric Steam Generator Low Pre-trip and Trip logic actions, and annunciator setpoints to be in the allowable band.

The Turbine Loss of Load Channels, shutdown alarm and trip channel check, was performed. This test verified that with the Turbine offline, the four RPS channel's Turbine Loss of Load Trip logic actions, subsequent Trip, and annunciations, occurred at 15% Nuclear power.

The High Containment Pressure Channels, monthly alarm and trip channel check, was performed. This test verified the four RPS channel's for High Containment Pressure Trip logic actions, and annunciation.

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.15

Test Precis: (cont.)

The Manual Trip Channels, shutdown alarm and trip channel check, was performed. The RPS Cabinet Manual Trip Pushbutton was verified to open RPS Circuit Breakers CB-AB and CB-CD, trip the Clutch Power Supplies, and trip the Turbine. Diesel Generator start, annunciators, Station Computer reaction and Post Trip Review Log printout was verified. Reset was performed and verified. Main Control Board Manual Reactor Trip was performed, and the same results verified, with the following exceptions, Trip Contactors M1 thru M4 opened and the other train Diesel started.

The RPS Logic Units, monthly operation of logic networks and clutch power contactors, was performed. RPS power supplies were tested for nominal voltage, amps and ground indications. Each Trip unit for each Matrix Coincidence Trip Logic combination was tested to actuate. Each Matrix Trip Circuit was in turn, tested to trip each Matrix Relay, it's Clutch Power Supply, Load Contactor and actuate indicating lamps.

The Axial Power Distribution Channels, monthly alarm and trip channel check and calibration was performed. This test verified the High Power Trip and also verified the four RPS channel's Internal and External Axial Power Distribution, Pre-trip and Trip logic actions, and annunciator setpoints to be in the allowable band.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for the Reactor Protective System.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline:

RPS Normal Operation, OI-RPS-1
RPS Thermal Margin/Low Pressure/T_{cold}, OI-RPS-2
Reactor Coolant Flow, ST-RPS-3
Thermal Margin/Low Pressure Channels, ST-RPS-4
High Pressurizer Pressure Channels, ST-RPS-5
Steam Generator Level Channels, ST-RPS-6

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.15

Baseline: (cont.)

Steam Generator Pressure Channels, ST-RPS-7
High Containment Pressure Channels, ST-RPS-8
Turbine Loss of Load Channels, ST-RPS-9
Manual Trip Channels, ST-RPS-10
RPS Logic Units, ST-RPS-11
Axial Power Distribution Channels, ST-RPS-12

Test Status: 1 Date completed: 5/30/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.16

Test Name: ENGINEERED SAFEGUARDS SYSTEMS TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Engineered Safeguards System (ESF), the following surveillances were performed:

Pressurizer Pressure Low Signal
Safety Injection Actuation
Containment Pressure High Signal
Containment Spray Logic
SIRW Tank Low Level Signal
Steam Generator Low Pressure Signal
Recirculation Actuation Logic
Offsite Power Low System

Initial Conditions:

IC-14	BOC, 100% Power, Equil Xenon
IC-01	BOC Cold Shutdown - RCS Drained

Test Precis: The Pressurizer Pressure Low Signal (PPLS), monthly alarm and trip channel check, was performed. This test verified the four RPS channel's Pressurizer Pressure Low Trip actions, indications and reset setpoints to be in the allowable band. The PPLS and Blocking Logic Calibration refueling test was performed. This test was a functional check of the integrated ESF signals and resulting equipment actuation signals initiated by low Pressurizer Pressure Transmitter signals. Each Transmitter pair (A-B, A-C, A-D, B-C, B-D, C-D) in turn, had a lowering pressure inputted to it. PPLS, SIAS, CIAS, and VIAS alarm and lockout relay actuations were verified to occur. The PPLS Block (override) actuation and annunciators were verified operable.

The Safety Injection Actuation Signal monthly test was performed. This test was a functional check of the Train A integrated ESF signals and resulting equipment actuation signals. Train A PPLS, CPHS, SIAS, CIAS, VIAS lockout relays, Containment Isolation Valves and ERF computer printouts were verified to actuate. Following reset, Train B testing was conducted in a similar fashion.

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.16

Test Precis: (cont.)

Channel A Automatic Engineered Safeguards Actuation, Manual Safety Injection Initiation, Manual Containment Spray Initiation and Manual Containment Isolation Initiation was performed. These tests were functional verifications of the initiating circuits, lockout relays, overrides, sequencers, manual control circuits, and affected equipment responses for the Train A individual tests. Following component repositioning and reset, Channel B was tested in a similar fashion.

The Containment Pressure High Signal (CPHS), monthly operation check was performed. The CPHS matrix logic was verified to deenergize by actuating pressure switch pairs. The CPHS Calibration refueling surveillance was performed. This test was a functional check of the Train A CPHS signal and resultant relay actuation signals initiated by high Containment Pressure Transmitter inputs. Each Transmitter pair (A-B, A-C, A-D) in turn, had a rising pressure inputted to it. CPHS, SIAS, CIAS, and VIAS relays were verified to actuate. Following component repositioning and reset, Train B was tested in a similar fashion.

The Containment Spray Logic Signal Train A monthly test was performed as a subtest of the Safety Injection Actuation Test. This test verified the operability of the PPLS and CSAS relays. Train B was tested in a similar fashion. The Containment Spray Actuation refueling test was performed. Train A PPLS, CPHS, SIAS, CIAS, VIAS lockout relays, breakers, and Containment Isolation Valves were verified to actuate. Following reset, Train B testing was conducted in a similar fashion.

The Safety Injection Refueling Water (SIRW) Tank Low Level Signal monthly channel check was performed. The matrix lamps were verified to deenergize by failing SIRW tank level bistables.

Test Number: 14.5.1.2.16

Test Precis: (cont.)

The SIRW Tank Low Level Signal refueling surveillance was performed. This test was a functional check of the Train A SIRW tank low level circuitry and resulting relay actuation signals initiated by SIRW level bistables. Each Bistable pair (A-B, A-C, A-D) in turn, had a low level inputted to it. Matrix lamps and STLS relays were verified to actuate. Following component repositioning and reset, Train B was tested in a similar fashion.

The Steam Generator Low Pressure Signal (SGLP), monthly indication and trip channel check was performed. This test verified the four RPS channel's Steam Generator Pressure Low Trip actions, indications and reset setpoints to be in the allowable band. The SGLS and Blocking Logic Calibration refueling test was performed. This test was a functional check of the ESF Train A signals and resulting equipment actuation signals initiated by low Steam Generator Pressure Transmitter signals. Each Transmitter pair (A-B, A-C, A-D, B-C, B-D, and C-D) in turn, had a lowering pressure inputted. SGLS alarm, lockout relays and valve actuations were verified to occur. The SGLP Block (override) and attendant annunciators were verified to be operable during each actuation. Train B was tested in a similar fashion.

The Recirculation Actuation Logic (RAS) monthly channel check was performed as a subtest of the Safety Injection Actuation Test. This test verified the operability of the Train A RAS relays, overrides, matrix lamps and isolation valve. Train B was tested in a similar fashion. The RAS Logic and Switch refueling test was performed. Train A CPHS, SIAS, CIAS, VIAS, STLS and RAS lockout relays, breakers, and Containment Isolation Valves were verified to actuate. Following reset, Train B testing was conducted in a similar fashion.

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.16

Test Precis: (cont.)

The Offsite Power Low System (OPLS), monthly channel check was performed. This test verified the individual operability of OPLS annunciators, matrix relay and sequencer indications for incoming transformers, busses and switchgears. The OPLS Matrix refueling check was performed. This test was a functional check of OPLS matrix signals and resulting breaker actuations, crossties, load shed and equipment actuation signals initiated by test switch operation.

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for the Engineered Safeguards System.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline:
Pressurizer Pressure Low Signal, ST-ESF-1
Safety Injection Actuation, ST-ESF-2
Containment Pressure High Signal, ST-ESF-3
Containment Spray Logic, ST-ESF-4
SIRW Tank Low Level Signal, ST-ESF-7
Steam Generator Low Pressure Signal, ST-ESF-11
Recirculation Actuation Logic, ST-ESF-13
Offsite Power Low System, ST-ESF-14

Test Status: 1 Date completed: 1/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.17

Test Name: NUCLEAR INSTRUMENTATION SYSTEM TESTING

Description: To verify that operator conducted surveillance testing can be performed on the Nuclear Instrumentation System (NIS), the following surveillances were performed:

Power Range Safety Channels
Wide Range Logarithmic Channels
Rod Drop Indication

Initial Conditions:

IC-14	BOC, 100% Power, Equil Xenon
IC-01	BOC Cold Shutdown - RCS Drained

Test Precis: The Power Range Safety Channels Adjustment daily check and calibration was performed. This test compared Plant Computer calculated core power to RPS Delta T and NI power, and recalibrated those powers to calculated power as required. The "in lieu of Plant computer calculated" manual Core Thermal Power calculation was also performed. The Power Range Safety Channels monthly test was performed for each channel. Variable Over Power Pre-trip and Trip setpoints were calibrated with respect to Linear and Delta T Power. Linear Power Upper and Lower Subchannels, Linear Power Pre-trip and Trip were calibrated. Two of Four Control Element Assembly Withdrawal Prohibit (CWP), was verified to actuate on all Pre-trip combinations.

The Wide Range Logarithmic Channels shutdown functional check was performed. The High DPM (Start Up Rate of change) Pre-trip and Trip functions were verified to actuate above 10^{-4}% Power. Linear Power was set to 15% and the Pre-trip only was verified enabled. Two of Four CWP was verified to actuate on all Rate of Change Pre-trip combinations.

The Rod Drop Indication refueling check was performed. This test verified that a sudden lowering of any channel's Linear Power readings would give Rod Drop annunciation.

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.17

Test Precis: (cont.)

The results of the above surveillances showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for the Nuclear Instrumentation System.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Power Range Safety Channels, ST-RPS-1
Wide Range Logarithmic Channels, ST-RPS-2
Rod Drop Indication, ST-RD-1

Test Status: 1 Date completed: 4/1/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
PLANT NON-FLUID SYSTEM TESTS

Test Number: 14.5.1.2.18

Test Name: INCORE NUCLEAR INSTRUMENTATION TESTING

Description: To verify that operator conducted surveillance testing can be performed on Incore Instrumentation, the Core Exit Thermocouples surveillance was performed.

Initial Conditions:

IC-14 BOC, 100% Power, Equil Xenon

Test Precis: The Core Exit Thermocouples (CET), monthly channel check was performed. This test verified minimum QSPDS Channel A & B valid quadrant CETs operability criteria.

The results of the above surveillance showed the simulator capable of performing within the acceptance criteria of the Fort Calhoun Station Surveillance Testing for the Incore Nuclear Instrumentation System.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Core Exit Thermocouples, ST-CET-1

Test Status: 1 Date completed: 1/6/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
CORE PERFORMANCE TESTS

Test Number: 14.5.2.1

Test Name: ROD WORTH TESTS

Description: This test verified the simulator's core physics calculations of banked rod worths as matching FCS Unit 1 data over core age.

Initial Conditions:

Temp.IC-81 BOC, Hot Zero Power, Xenon Free, T_{cold} = 532 F.

Temp IC-86 MOC, Hot Zero Power, Xenon Free, T_{cold} = 532 F.

Temp.IC-16 EOC, Hot Zero Power, Xenon Free, T_{cold} = 532 F.

Test Precis: The test was performed by initializing the simulator to HZP at BOC and EOC conditions, then withdrawing banked rods in 12.5" increments. The data values for integral and sequential worths of the shutdown and regulating banks were plotted and then compared to FCS BOC and EOC core data.

Results showed Total integral worth 4% delta RHO, Group integral worth 5% delta RHO, and Regulating Groups 1-4 sequential integral worth curves 10% of baseline data.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: FCS Unit 1 Technical Data Book Fig. II.B.1a, II.b.2a & II.B.2b, Post Refueling Core Physics Testing and Power Ascension, SP-PRCPT-1.

Test Status: 1 Date Completed: 4/16/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
CORE PERFORMANCE TESTS

Test Number: 14.5.2.2

Test Name: BORON WORTH TESTS

Description: This test verified the simulator's core physics calculations of boron worth at differing core ages correspond to FCS Unit 1 data for the same conditions.

Initial Conditions:

Temp.IC-81 BOC, Hot Zero Power, Xenon Free, T_{cold} = 532 F.

Temp.IC-86 MOC, Hot Zero Power, Xenon Free, T_{cold} = 532 F.

Temp.IC-16 EOC, Hot Zero Power, Xenon Free, T_{cold} = 532 F.

Test Precis: The test was performed by initializing the simulator to HZP at BOC, MOC and EOC conditions, collecting data, then comparing the boron worth obtained with FCS Unit 1 data for those conditions.
Results showed boron worth within 5% delta RHO of the baseline data.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: FCS Unit 1 Technical Data Book Figure II.A.4.

Test Status: 1 Date Completed: 4/16/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
CORE PERFORMANCE TESTS

Test Number: 14.5.2.3

Test Name: ISOTHERMAL TEMP COEFFICIENT TEST

Description: This test verified the simulator's core physics calculations for the Isothermal Temperature Coefficient to correspond to FCS Unit 1 core physics data.

Initial Conditions:

Temp.IC-80 BOC, Hot Zero Power, Xenon Free, T_{cold} = 532 F.

Test Precis: The test was performed by begun by initializing the simulator to HZP conditions and initiating data collection.

Holding Power constant with CEAs, temperature was then raised and lowered with Steam Dump and Bypass or Atmospheric Dump.

The reactivity data values collected were then compared to FCS Unit 1 values.

Results showed boron worth within .30 x 10^{-4} delta RHO per degree F of the baseline data.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: FCS Unit 1 Cycle 11 Low Power Physics Test Report, June 4 thru June 7, 1987

Test Status: 1 Date Completed: 3/06/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
CORE PERFORMANCE TESTS

Test Number: 14.5.2.4

Test Name: POWER COEFFICIENT TEST

Description: This test verified the simulator's core physics calculations for the Power Coefficient to correspond to FCS Unit 1 core physics data.

Initial Conditions:

Temp.IC-81 BOC, Hot Zero Power, Xenon Free, T_{cold} = 532 F.

Test Precis: The test was begun by initializing the simulator to HZP conditions, and collecting data.

Holding temperature constant with Steam Dump and Bypass or Atmospheric Dump, CEAs were then used to lower Power.

Moderator Temperature Coefficient Test ST-MTC-1.F.2 was then performed.

The reactivity data values collected were then compared to FCS Unit 1 values.

Results showed calculated power defect to be within 10% and values for ST-MTC-1.F.2 to be realistic compared to baseline data.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: FCS Unit 1 Moderator Temperature Coefficient Surveillance Test ST-MTC-1, FCS Completed Test ST-MTC-1, Technical Data Book, Fig. II.C.3 and Fig. II.B.2.a

Test Status: 1 Date Completed: 3/06/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
CORE PERFORMANCE TESTS

Test Number: 14.5.2.5

Test Name: XENON TESTS

Description: This test verified the simulator's core physics calculations for Xenon to correspond to FCS Unit 1 core physics data.

Initial Conditions:

Temp.IC-89	MOC, 25% Power, Equil. Xe.
Temp.IC-88	MOC, 50% Power, Equil. Xe.
Temp.IC-87	MOC, 75% Power, Equil. Xe.
Temp.IC-85	MOC, 100% Power, Equil. Xe.
Temp.IC-80	EOC, 100% Power, Equil. Xe.
Temp.IC-83	BOC, 50% Power, Equil. Xe.
Temp.IC-82	BOC, 50% Power, Equil. Xe.
Temp.IC-21	MOC, 100% Power, Equil. Xe.

Test Precis: The test performance was begun by initializing into 25, 50, 75 & 100% Power levels at MOC. The Xenon reactivity data obtained was then compared to FCS Unit 1 values for the same condition.

Post trip xenon data was obtained by initialization to 100% Power, BOC, Xenon equilibrium conditions, performing a Reactor trip and a 48 elapsed hour plot of Power, Xenon and T_{hot}. The data obtained was then compared to FCS Unit 1 values for the same condition.

The same Post trip test was then performed for 50% Power BOC, and the results were compared to FCS Unit 1 values for the same condition.

Up-Power xenon data was obtained by initializing into 50% Power, BOC, Equilibrium Xenon, and performing a normal power increase to 100% full rated power. A 40 elapsed hour plot of Power, Xenon and T_{hot} was collected and the data obtained was then compared to a power increase curve.

Down-Power xenon data was obtained by initializing into 100% Power, BOC, Equilibrium Xenon, and performing a normal power decrease to 50% rated power.

PERFORMANCE TEST ABSTRACT
CORE PERFORMANCE TESTS

Test Number: 14.5.2.5

Test Precis: (cont.)

A 40 elapsed hour plot of Power, Xenon and T_{hot} was collected and the data obtained was then compared to a power decrease curve.

A radial Xenon oscillation was induced by initializing into 100% Power, MO[illegible] Equilibrium Xenon, dropping and recovering dropped rods. [illegible] oscillation obtained was verified to dampen with norm[illegible] rod control.

An axial Xenon oscillation was induced by initializing into 100% Power, BOC, Equilibrium Xenon, inserting then withdrawing rods. The oscillation obtained was verified to dampen with normal rod control.

Results showed Xenon worth to be within 10% of baseline, with transient Xenon magnitude and direction realistic.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: FCS Technical Data Book Figure II.D.4 and II.D.1, Westinghouse Reactor Theory and Core Physics Training Manual

Test Status: 1 Date Completed: 2/16/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
CORE PERFORMANCE TESTS

Test Number: 14.5.2.6

Test Name: ESTIMATED CRITICAL POSITION TESTS

Description: This test verified the simulator's integration of core physics data, and verified that the FCS Estimated Critical Position Procedure can be used.

Initial Conditions:

Temp.IC-80	BOC, 100% Power, Equil. Xenon
Temp.IC-16	EOC, 100% Power, Equil. Xenon
Temp.IC-89	BOC, Cold Shutdown, Xenon Free

Test Precis: The test was performed by initializing into 100% Power, BOC, equilibrium Xe. conditions, then performing a Reactor trip. and calculating an ECP.

A Reactor start-up was performed to low in the power range, then the critical data and ECP were verified to correlate.

The test and evaluation was then performed again using an EOC configuration.

A third ECP was performed, using cold shutdown, Xenon free conditions at BOC. A Reactor startup was then perform. The results of the critical data and ECP were found to correlate satisfactorily.

The results of testing showed criticality rod height to be within .5% delta RHO of the ECP.

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: FCS Technical Data Book TBD V.1

Test Status: 1 Date Completed: 4/16/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
REMOTE PANEL TESTS

<u>Test Number:</u> 14.5.6.1

<u>Test Name:</u> EMERGENCY AUXILIARY FEEDWATER PANEL TEST

<u>Description:</u> This test verified the ability of the simulator to allow operation of the Emergency Auxiliary Feedwater Panel in a realistic fashion.

<u>Initial Conditions:</u>

IC-14 BOC, 100% Power, Equil. Xenon

<u>Test Precis:</u> Following Manual Reactor Trip, the Control Room was evacuated and within the scope of simulation, the Emergency AFW Panel (AI-179) was used to verify and maintain Core and RCS heat Removal Safety functions.

The test was performed in accordance with AOP-7, FORCED EVACUATION OF CONTROL ROOM and AOP-6, FIRE EMERGENCY. This integrated test used AI-179, and the Alternate Shutdown Panel, (AI-185), the Neutron Monitoring Panel, (AI-212), the #2 Emergency Diesel Panel (AI-133B), installed controls, local operator actions and overrides.

The test verified the simulator was able to conduct post trip plant stabilization, followed by boration and cooldown to cold shutdown conditions.

To fully test the simulator using AOP-7, where the procedure directed alternative actions upon a condition not met, the alternative method was tested.

The test results showed, that following the correction of trouble reports, the Emergency Auxiliary Feedwater Panel will be operable.

<u>Simulator Response Assessment:</u> Best Estimate

<u>Baseline:</u> Abnormal Operating Procedure, AOP-7, FORCED EVACUATION OF CONTROL ROOM and AC 5, FIRE EMERGENCY

PERFORMANCE TEST ABSTRACT
REMOTE PANEL TESTS

Test Number: 14.5.6.1

Test Status: 2 Date completed: *future

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

Trouble Report, # / Description

4037 / No LOA exists for Pzr Heaters in Alt. Shutdown panel area

4253 / SBM switch overrides are difficult to implement

PERFORMANCE TEST ABSTRACT
REMOTE PANEL TESTS

Test Number: 14.5.6.2

Test Name: ALTERNATE SHUTDOWN PANEL TEST

Description: This test verified the ability of the simulator to allow operation of the Alternate Shutdown Panel in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The Reactor was tripped manually, the Control Room was evacuated and within the scope of simulation, the Alternate Shutdown Panel (AI-185), was used to verify and maintain Reactivity, RCS Inventory and RCS Pressure Safety functions.

The test was performed in accordance with AOP-7, FORCED EVACUATION OF CONTROL ROOM and AOP-6, FIRE EMERGENCY. This integrated test used AI-185, Emergency Auxiliary Feedwater Panel (AI-179), the Neutron Monitoring Panel, (AI-212), the #2 Emergency Diesel Panel (AI-133B), installed controls, local operator actions and overrides.

The test verified the simulator was able to conduct post trip plant stabilization, followed by boration and cooldown to cold shutdown conditions.

To fully test the simulator using AOP-7, where the procedure directed alternative actions upon a condition not met, the alternative method was tested.

The test results showed, that following the correction of trouble reports, the Alternate Shutdown Panel will be operable.

Simulator Response Assessment: Best Estimate

Baseline: Abnormal Operating Procedure, AOP-7, FORCED EVACUATION OF CONTROL ROOM and AOP-6, FIRE EMERGENCY

PERFORMANCE TEST ABSTRACT
REMOTE PANEL TESTS

Test Number: 14.5.6.2

Test Status: 2 Date completed: *future

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

Trouble Report, # / Description

4037 / No LOA exists for Pzr Heaters in Alt. Shutdown panel area

4253 / SBM switch overrides are difficult to implement

PERFORMANCE TEST ABSTRACT
REMOTE PANEL TESTS

Test Number: 14.5.6.3

Test Name. NEUTRON MONITORING PANEL TEST

Description: This test verified the ability of the simulator to allow operation of the Neutron Monitoring Panel in a realistic fashion.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The Reactor was tripped, the Control Room was evacuated and within the scope of simulation, the Neutron Monitoring Panel was used to verify the Reactivity Safety function.

The test was performed in accordance with AOP-7, FORCED EVACUATION OF CONTROL ROOM and AOP-6, FIRE EMERGENCY. This integrated test used the Neutron Monitoring Panel, (AI-212), the Alternate Shutdown Panel (AI-185), the Emergency Auxiliary Feedwater Panel (AI-179), the #2 Emergency Diesel Panel (AI-133B), installed controls, local operator actions and overrides.

The test verified the simulator was able to conduct post trip plant stabilization, followed by boration and cooldown to cold shutdown conditions.

To fully test the simulator using AOP-7, where the procedure directed alternative actions upon a condition not met, the alternative method was tested.

The test results showed, that following the correction of trouble reports, the Alternate Neutron Monitoring Panel will be operable.

Simulator Response Assessment: Best Estimate

Baseline: Abnormal Operating Procedure, AOP-7, FORCED EVACUATION OF CONTROL ROOM and AOP-6, FIRE EMERGENCY

PERFORMANCE TEST ABSTRACT
REMOTE PANEL TESTS

Test Number: 14.5.6.3

Test Status: 2 Date completed: *future

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

Trouble Report, # / Description

4037 / No LOA exists for Pzr Heaters in Alt. Shutdown panel area

4253 / SBM switch overrides are difficult to implement

PERFORMANCE TEST ABSTRACT
REMOTE PANEL TESTS

Test Number: 14.5.6.4

Test Name: D-2 DIESEL GENERATOR AND ENGINE CONTROL PANEL TEST

Description: This test verified the ability of the simulator to model Appendix R requirements for Control Room Fire Isolation Criteria on Diesel Generator 2.

Initial Conditions:

IC-14 BOC, 100% Power, Equil. Xenon

Test Precis: The test was performed by placing the Diesel Generator DG-2 Master Emergency switch 183/[illegible]ES in the Emergency position. This limits Train B [illegible] [illegible]radation from a fire by initiating an Emer[illegible] load shed and a 480 V load shed of Channel B components.

Local control of the Diesel was then taken to the Engine Control Panel by rotating 143/SS to Local Maintenance position. This disables all Automatic starts, Control Room signals and isolates to local control all Diesel control functions.

Testing was then performed on breaker controls, annunciators and Diesel control circuits to verify remote functions were isolated.

Testing results showed the Diesel Controls to function in a realistic fashion.

Simulator Response Assessment: Best Estimate

Baseline: ST-ESF-14 Appendix A, Surveillance Test of Diesel Emergency Transfer Switch 183/MES for DG2

Test Status: 1 Date Completed: 5/19/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

PERFORMANCE TEST ABSTRACT
INITIAL CONDITION CHECKLIST

Test Number: 14.5.7

Test Name: INITIAL CONDITION CHECKLIST

Description: This test documents the parameter readings used by the simulator, for the protected Initial Condition (IC) Set. ICs were developed using FCS critical and monitored parameter value data, and by taking snapshots of conditions achieved during startup testing.

Initial Conditions:

IC-01	BOC Cold Shutdown - RCS Drained
IC-02	BOC Cold Shutdown - Pzr Bubble
IC-03	BOC RCS Heatup in Progress
IC-04	BOC RCS Cooldown in progress - on SDC
IC-05	BOC RCS Cooldown in progress - prior to SDC
IC-06	BOC RCS Hot Shutdown - Borated
IC-07	BOC Rx Startup in progress
IC-08	BOC Rx Critical - Cold Turbine Startup
IC-09	BOC 15% Power - 2% Xenon
IC-10	BOC 30% Power - 5% Xenon
IC-11	BOC 55% Power - 10% Xenon
IC-12	BOC 55% Power - Equil. Xenon
IC-13	BOC 80% Power - Equil. Xenon
IC-14	BOC 100% Power - Equil. Xenon
IC-15	MOC Rx Startup in progress - Post Trip - 150% Xenon
IC-16	MOC Rx Critical - Warm Turbine - 150% Xenon
IC-17	MOC 15% Power - Post trip
IC-18	MOC 30% Power - Extended Low Power Run - 50% Xenon
IC-19	MOC 55% Power - Post trip - 105% Xenon Decreasing
IC-20	MOC 55% Power Decreasing - 105% Xenon
IC-21	MOC 100% Power - Equil. Xenon
IC-22	EOC Reactor Startup in progress, Xenon Free
IC-23	EOC 80% Power Decreasing - 110% Xenon - Deboration
IC-24	EOC 100% Power - Equil. Xenon

IC-25
Thru
IC-30 are Reserved

PERFORMANCE TEST ABSTRACT
INITIAL CONDITION CHECKLIST

Test Number: 14.5.7

Test Precis: The test was performed by initializing into each IC and recording the following:

RCS T_{hot}
RCS T_{cold}
Pzr Pressure and Level
RCS Boron
Wide Range NI Power
Core Megawatts
CEA Position
Generator Megawatts
RCS T_{avg}
Xenon
RCPs
Core Age

Simulator Response Assessment: Plant Data and Best Estimate

Baseline: Letter WFCS-89-305, dated Feb. 28, 1989 to Mr. R.P. Clemens - Critical and Monitored Parameter Values.

Test Status: 1 Date Completed: 7/28/90

1 = Satisfactory; 2 = More Testing Required; 3 = Unsatisfactory

ANSI/ANS 3.5 Compliance:

Did this test reveal any exception to ANSI/ANS 3.5? No

If Yes, documentation continues on attached page(s).

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION

Simulator Certification Submittal

Section 4

OMAHA PUBLIC POWER DISTRICT
FORT CALHOUN STATION

Simulator Certification Submittal
Section 4

4.1 INTRODUCTION

The purpose of this section is to describe the simulator modification process and discrepancy resolution schedule. The methods used to identify, log, correct and test reported simulator discrepancies will be described. The methods used to identify and track the design changes made to the reference plant, but not yet incorporated into the simulator will be described also.

4.2 SIMULATOR DISCREPANCIES

Simulator discrepancies are identified by two different means. The first method is the ongoing acceptance testing program that is still being carried out during the warranty period from the simulator manufacturer. The second method is the Discrepancy Report (DR) process.

Since acceptance testing continues, and will continue through the warranty period, the performance of these tests is a suitable means of finding and documenting problems by using Trouble Reports (TRs). The process of retesting TRs also sometimes leads to the uncovery of "new" discrepancies that are then in turn documented with TRs. There are also over 100 outstanding TRs still remaining from the Factory Acceptance Testing that was done at the simulator manufacturer's facilities. The TRs are numerically generated, and maintained in a database that resides on the SUN computers used for the Configuration Management Database. Any TR can be called up on various CRTs located in the simulator complex. A number of different reports can group the TRs by various subjects and can be generated and printed for use at any time. The TR database is also accessible via modem from the simulator manufacturer's site, and allows the warranty work to continue without having to send physical paper copies of the TRs back and forth.

The other method for identifying discrepancies is the DR. There is a discrepancy report log book that is normally kept in the simulator instructor booth that is used by the simulator instructors to document problems that they have found during actual training sessions. These DRs end up being a culmination of problems that the trainees have noticed and indicated to the instructor and problems that the instructors have noticed themselves while operating the simulator. These DRs are reviewed regularly by simulator services department personnel for accuracy. This means that sometimes duplication of the problem is necessary to ascertain where the problem exists, or a simple explanation of why the simulator acted the way it did is needed. If there is a real problem, and the problem is deemed to be a warranty problem, a TR is written to document it. If the problem is deemed to actually be a design flaw or other problem that demands a simulator modification, it will still be written as a TR with a special flag indicating that it concerns a modification. After review, the DR is then kept in the DR log book as an active DR, or it is cleared and entered into another log book; the Cleared DR log book. This allows the instructors to check the DR log book for a problem that they have found, and prevents duplication. The initiator of the DR is also informed of the disposition of the DR which he initiated.

4.3 SIMULATOR MODIFICATIONS

Simulator modifications are necessary to ensure that the simulator matches the reference plant as closely as possible. Since the simulator design was frozen in July 1988, there have been two refueling outages performed at the plant. These outages were the cycle 12 outage, and the cycle 13 outage. Therefore, the simulator lags behind the current configuration of the plant. The modifications that have been done to the plant have been tracked since those outages however, so that they could be incorporated into the simulator. Information of the modifications to catch the simulator up with the plant, as well as general modification performance is discussed below:

4.3.1 Plant Modifications To Be Done To The Simulator

Section 1.2 of this certification submittal listed the modifications to be made to the simulator as a result of the last two refueling outages. This list appeared in a prioritized order according to importance to operations training, as well as other criteria. Since these modifications had already been tracked, identifying which ones were to be done was relatively simple. A review of all the modifications was done to determine which ones had impact on the simulator.

Another pass was made to determine which modifications involved hardware changes, software changes or both types of changes.

These modifications were then subjected to a numerical rating process in order to try and determine the order in which the modifications should be installed. This rating process took into consideration the following categories and their respective subcategories:

- Training Impact
  - Availability
  - Physical Fidelity
  - Operations Modification Training
  - Software Fidelity
- Simulator Operability
  - Reliability
  - Stimulation vs. Simulation
- Simulation Improvement
  - Mathematical Fidelity
  - Modification Type
- Regulatory
  - Regulatory & Commitments

After going through this process, the numerically rated list was presented to the Operations Training Department and the Operations

Supervisor at the plant. Input was solicited from them as to which modifications were important to them to be installed ahead of other modifications. Their input was factored into the process and a final priority was determined. This list was used to prioritize modification work of the simulator support department. The actual sequence for installation of a modification is determined by availability of parts and complexity of the modification in conjunction with its priority.

4.3.2 General Modification Process

All of the modifications referred to above are subjected to the same general modification process as any other modification. The only difference is how they were identified initially. In general, simulator modifications can come from a number of different sources. They can originate from modification TRs or they can originate from the other tracking process. Figure 1-4 indicates a general flow path taken by the modification as it transverses the modification procedure.

Modifications that are generated for the plant are tracked by a mainframe computer type of database known to us as the Automated Modification Request Tracking System (AMRTS). The simulator department has a program that ties into the AMRTS system to download modifications that are ongoing at the plant. Other plant configuration changes that may occur are identified by the Training Program Configuration Management system (TPCM). These types of plant changes (procedures, setpoints, operating experience, etc.) are reviewed by a panel, of which a member is a simulator cognizant individual. This individual will flag any item that the panel may review as having possible impact on the simulator.

Once a plant modification has been identified as having possible simulator impact, the System Acceptance Committee (SAC) approved modification package is requested from the plant. This package is reviewed by the simulator department to determine if indeed there is a modification necessary. If it is determined that a modification is

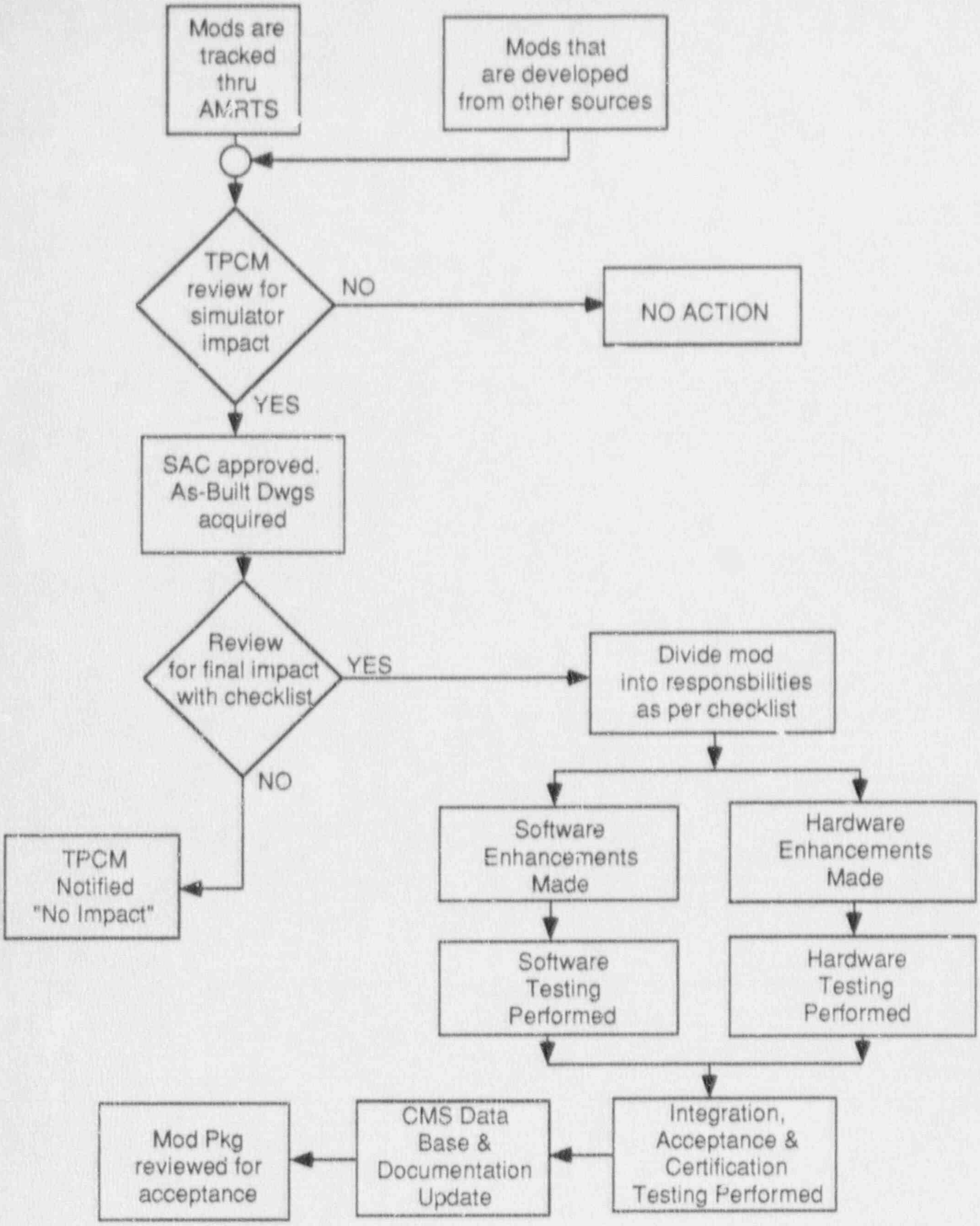

FIGURE 4-1
Simulator Modification Flow Path

needed, the design package is subjected to a checklist to determine specific areas of the simulator design that will be affected. This checklist is shown in Figure 4-2. A simulator Design Change package is then initiated, and the modification to the simulator may begin.

After the software and/or hardware enhancements are performed, the testing of the modification must be done. This testing includes integration testing, system testing, acceptance testing, and any certification testing that must be done to ensure that the modification to the simulator operates as closely to the actual plant as possible. The Configuration Management System (CMS) database must then be updated as well as the necessary simulator documentation. The simulator design change package is then reviewed for acceptance and closed out.

The list of modifications that appeared in Section 1.2 of this certification submittal is reproduced in Appendix B of this submittal in a form that generally shows the status of each modification at a given time. We have currently scheduled a seven week simulator outage this year beginning on February 25, 1991. As many of the modifications as possible that were done to the reference plant during the last two refueling outages will be incorporated into the simulator during this seven week outage. Appendix B is listed in order of priority that was assigned to the modifications during the review process described above.

FORT CALHOUN SIMULATOR
MODIFICATION PACKAGE CHECKLIST

MOD TITLE ______________________ MOD # ________

HARDWARE

- ☐ Hardware needs to be ordered?
- ☐ Hardware ordering lead time?
- ☐ BOM Update required?
- ☐ Wire list generation needed?
- ☐ Panel modifications required?
- ☐ Hardware functional testing required?

DBD UPDATE

- ☐ Component listing update required?
- ☐ DBD drawing update required?
- ☐ System description update required?
- ☐ Software interface diagram update required?
- ☐ Reference listing update required?
- ☐ Instrument loop drawing update required?
- ☐ Annunciator drawing update required?

DATABASE UPDATE

- ☐ SQL scripts required?
- ☐ Reference documentation update needed?
- ☐ Component data entry required?
- ☐ Card decks need to be re-inited?
- ☐ Update info recorded for certification?

MODEL UPDATE

- ☐ DBD changes reflected in model?
- ☐ Change log update required?
- ☐ DBD model documentation update?
- ☐ Performance criteria needed?
- ☐ Actual test data required?
- ☐ Datapool update required?

ERF/PLANT COMPUTER

- ☐ ERF Database update required?
- ☐ Display update needed?
- ☐ Program code change required?
- ☐ Vendor documentation update needed?
- ☐ OPPD documentation update needed?

INSTRUCTOR SYSTEM UPDATE

- ☐ P&ID update required?
- ☐ Interface update needed?
- ☐ Program code change required?
- ☐ LOA updates required?
- ☐ PPP updates required?
- ☐ Overrides update needed?
- ☐ Malfunctions update needed?

HANDLER UPDATE

- ☐ Interlock handler update needed?
- ☐ Component logic handler update needed?
- ☐ Auto action handler update needed?
- ☐ Controller handler update needed?
- ☐ Valve handler update needed?
- ☐ Pump handler update needed?
- ☐ Instrumentation handler update needed?
- ☐ Bistable handler update needed?
- ☐ Alarm handler update needed?
- ☐ Heat exchanger handler update needed?
- ☐ Control valve handler update needed?
- ☐ Delay handler update needed?
- ☐ Status light handler update needed?

FIGURE 4-2
Simulator Modification Checklist

FORT CALHOUN SIMULATOR
MODIFICATION PACKAGE CHECKLIST

MOD TITLE ______________________________ MOD # ________

STAND ALONE TESTING

- ☐ MCB hardware tests necessary?
- ☐ Levels, pressures, flows and temps checked?
- ☐ System logic tested?
- ☐ Instructor system interfaces tested?

INTEGRATION TESTING

- ☐ Interfaces with other systems tested?
- ☐ Database printouts for system checked?
- ☐ Stability with other systems checked?

CERTIFICATION TEST UPDATE

- ☐ Any certification tests affected by this mod?
- ☐ Certification tests need to be run this year?

MALFUNCTION TESTING

- ☐ System transient behavior checked?
- ☐ Instructor system interface tested?
- ☐ Baseline data (plots) need to be obtained?

CLOSE OUT MR DATABASE

- ☐ Status needs to be updated in MR database?
- ☐ Any interfaces with TR database?
- ☐ Training notified of modification completion?

FIGURE 4-2 Cont.
Simulator Modification Checklist

APPENDIX A

MODIFICATION PRIORITY
LISTING/STATUS

Modification Status Sheet (as of 1/18/91)

				SDCP	Pkg	Cklist	HDW	HDW	HDW	SW	Test	SDCP	
PRI	MOD #		MOD TITLE	Gen	Rec	Done	Ord	Rec	In	In	Done	Comp	RFT
1	FC81-051	*	Control Room Ventilation System Modification										
2	FC85-128		Meter Scale Modifications										
3	FC88-017		Addition of a Third Aux Feedwater Pump										
4	FC85-136	*	SGLS Block Permissive Setpoints										
5	FC75A-061	*	Component Cooling Valves Control Circuits										
6	FC88-011	*	Instrument Air Containment Isolation Valve Replacement										
7	FC88-110	*	SI-3A/3B/3C Start Signal Logic Change										
8	FC89-025		RCS Narrow Range Level Instrument										
9	FC83-004B	*	Remaining VA-66 Flow Problems										
10	FC81-064	*	RCS Hot Leg Level Indication										
11	FC83-074		DC Sequencer Relay Replacement										
12	FC85-151		Replace Oddly Shaped Switch Handles										
13	FC87-037	*	Diesel Generator Electrical Modifications										
14	FC84-075		Redundant Power Supply for RW-CCW Interface Valves										
15	FC87-048	*	Diverse Scram System (DSS) Testing				N/A						
16	FC85-132	*	RCS Loop RTD Indicator Replacement										
17	FC88-067	*	Dedicated N2 Supply for Isolation Valves				N/A						
18	FC86-033		Evaluate Replacement of Proc/Area Radiation Monitors										
19	FC87-055		ERF Computer Terminal Upgrade										
20	FC85-196	*	Increased minimum flow for Pumps FW-4A/B/C				N/A						
21	FC86-046	*	Qualification of PZR Level Control Instrumentation										
22	FC87-016	*	Containment Sump Temperature Indication				N/A						
23	FC82-150B	*	Vac Dearator Pumps (DW-46A/B) Replacement				N/A						
24	FC86-096	*	RPS Power Supplies										
25	FC85-022	*	Control Room Annunciation for Limitorque Operators										
26	FC84-159	*	Metrascope Changeout										
27	FC86-049		Redistribute Loads/DC Buses and Inverters				N/A						
28	FC87-038	*	Diesel Generator Mechanical Modifications				N/A						
29	FC85-005		Heater Drain Pump Suction Relief Valves				N/A						
30	FC87-054	*	Fire Protection Systems Upgrade				N/A						
31	FC87-063	*	Diesel Generator Radiator Exhaust Damper Valves				N/A						
32	FC88-009	*	Control Room Iodine Monitor (RM-065) Modification										
33	FC85-126	*	Condensate/Feedwater Switch (43/FW) Alarm										
34	FC83-174		Reactor Reg/Steam Dump & Bypass Alarm										

Modification Status Sheet (as of 1/18/91)

PRI	MOD #		MOD TITLE	SDCP Gen	Pkg Rec	Cklist Done	HDW Ord	HDW Rec	HDW In	SW In	Test Done	SDCP Comp	RFT
35	FC87-032	*	Air Compressors for Fire Protection Deluge System										
36	FC88-022		CRDR Labeling/Demarcation/Mimic/Etc.										
37	FC88-074		DCRDR Meter Banding Project										
38	FC85-138	*	Guard Rail on Edge of Control Boards										
39	FC85-142	*	Replacement of Sigma Meter Scales										
40	FC84-176	*	Letdown Level and Backpressure Control				N/A						
41	FC87-014		Replacement of HCV-249 and HCV-2988				N/A						
42	FC85-148	*	CIAS Emergency Operate Button Relocation				N/A						
43	FC83-133		Control Room Indication-Diesel Gen Malfunction		CANCELLED								
44	FC88-036		Aux Controller for Feedwater Reg System										
45	FC85-137	*	Reactor Trip Pushbutton Guard										
46	FC83-166	*	Containment Sump Pump Level Indication and Control										
47	FC84-092B	*	Steam Generator Nozzle Dam Control Console										
48	FC85-130	*	Keylock Switch Changes										
49	FC85-150	*	Plastic Switch Guards										
50	FC88-049		Installation of Instrument Air Dryer										
51	FC89-051		Diesel Fuel Transer Pump Install										
52	FC89-068		AI-179 Indications				N/A						
53	FC86-091		Limitorque Motor Operator Update				N/A						
54	FC84-206	*	Setpoint Selector Switch for RM-061		CANCELLED								
55	FC74B-057	*	Power System Stabilizer				N/A						
56	FC85-088	*	Acoustic Noise Generator				N/A						

* indicates a Cycle 12 modification

APPENDIX B

SCHEDULE FOR PERFORMANCE AND OPERABILITY TESTS

Appendix B: Schedule for Performance and Operability Tests

Test Number	Test Title	Test I.D.	Assoc. System	Test Cycle	Test Type
Hardware Tests	____	____	____	____	____
14.2.1	Panel Visual Inspection			Initial	Hardware
14.2.2	Verification of Instrument Scales			Initial	Hardware
14.2.3	Verification of Nameplate and Annuc. Engravings			Initial	Hardware
Computer System Tests	____	____	____	____	____
14.3.3	Verification of Spare Computer Time			All	Operability
Handler Tests	____	____	____	____	____
14.4.4	Electrical Bus Test			1	Performance
14.4.5	Air System Test			3	Performance
Plant Fluid Systems	____	____	____	____	____
14.5.1.1.1	Reactor Coolant System		RCS	2	Performance
14.5.1.1.4	Chemical and Volume Control		CVC	2	Performance
14.5.1.1.5	Safety Injection System		SIS	3	Performance
14.5.1.1.6	Component Cooling Water		CCW	1	Performance
14.5.1.1.16	Auxiliary Feedwater System		AFW	1	Performance
14.5.1.1.17	Raw Water System		RWS	2	Performance
Non Fluid System Tests	____	____	____	____	____
14.5.1.2.1	Reactor Core		RXC	2	Performance
14.5.1.2.2	Control Rod Drive System		CRD	4	Performance
14.5.1.2.5	Containment		CNM	4	Performance
14.5.1.2.9	Diesel Generator		DSG	1	Performance
14.5.1.2.10	Inplant Electrical Distribution		EDS	1	Performance
14.5.1.2.12	D-G Sequencer		DSO	3	Performance
14.5.1.2.15	Reactor Protection System		RPS	1	Performance
14.5.1.2.16	Engineered Safeguards System		ESF	3	Performance
14.5.1.2.17	Nuclear Instrumentation System		NIS	4	Performance
14.5.1.2.18	Incore Nuclear Instrumentation System		ICI	4	Performance
Core Performance Tests	____	____	____	____	____
14.5.2.1	Rod Worth Test			2	Performance
14.5.2.2	Boron Worth Test			2	Performance
14.5.2.3	Isothermal Moderator Temp. Coefficient Test			2	Performance
14.5.2.4	Power Coefficient Test			2	Performance

Cycle 1=1991/95/99 Cycle 2=1992/96/2000 Cycle 3=1993/97/2001 Cycle 4=1994/98/2002

Appendix B: Schedule for Performance and Operability Tests

Test Number	Test Title	Test I.D.	Assoc. System	Test Cycle	Test Type
14.5.2.5	Xenon Test			2	Performance
14.5.2.6	ECP Test			2	Performance
Steady State Plant Operations	—	—	—	—	—
14.5.3.1	Normal Operations Test			All	Operability
Steady State Drift Tests	—	—	—	—	—
14.5.3.2.1	Steady State Drift @ 100%			All	Operability
14.5.3.2.2	Steady State Drift @ 80%			All	Operability
14.5.3.2.3	Steady State Drift @ 55%			All	Operability
14.5.3.2.4	Steady State Drift @ 30%			All	Operability
Steady State Accuracy Tests	—	—	—	—	—
14.5.3.3.1	Steady State Accuracy 100%			All	Operability
14.5.3.3.2	Steady State Accuracy 80%			All	Operability
14.5.3.3.3	Steady State Accuracy 55%			All	Operability
14.5.3.3.4	Steady State Accuracy 30%			All	Operability
Induced Transient Tests	—	—	—	—	—
14.5.4.1	Maximum Rate Power Ramp			All	Operability
14.5.4.2	Main Turbine Stop and Control Valve Testing			All	Operability
14.5.4.3	Inadvertent Boration Dilution			All	Operability
14.5.4.4	Reactor Trip and Recovery			All	Operability
14.5.4.5	Dropped Rod			All	Operability
14.5.4.6	Reactor Trip Test			All	Operability
14.5.4.7	Simultaneous Trip of MFW Pumps Test			All	Operability
14.5.4.8	Simultaneous Closure of MSIVs Test			All	Operability
14.5.4.9	Simultaneous Trip of All RCPs Test			All	Operability
14.5.4.10	Trip Any RCP Test			All	Operability
14.5.4.11	Loss Of Load			All	Operability
14.5.4.12	Maximum Rate Power Ramp (100-75-100)			All	Operability
14.5.4.13	LOCA With Loss of All Offsite Power			All	Operability
14.5.4.14	Excess Steam Demand			All	Operability
14.5.4.15	Slow RCS Depressurization To Saturation - No HPSI			All	Operability
Malfunction Tests	—	—	—	—	—
14.5.5.1.4	Emergency Feedwater Storage Tank Leak	AFW-4	AFW	1	Performance

Cycle 1=1991/95/99 Cycle 2=1992/96/2000 Cycle 3=1993/97/2001 Cycle 4=1994/98/2002

Appendix B: Schedule for Performance and Operability Tests

Test Number	Test Title	Test I.D.	Assoc. System	Test Cycle	Test Type
14.5.5.1.5	Auxiliary Feedwater Activation Relay Failure	AFW-5	AFW	1	Performance
14.5.5.2.2	Service Air System Leak	CAS-2	CAS	3	Performance
14.5.5.2.3	Instrument Air Loop Leak	CAS-3	CAS	3	Performance
14.5.5.2.4	Instrument Air Riser Leak	CAS-4	CAS	3	Performance
14.5.5.3.4	CCW Pump Discharge Header Leak	CCW-4	CCW	1	Performance
14.5.5.3.5	CCW Heat Exchanger Tube Leak	CCW-5	CCW	1	Performance
14.5.5.4.1	Loss of Main Condenser Vacuum	CND-1	CFW	4	Performance
14.5.5.4.4	Condensate Pump Bearing Failure	CND-4	CFW	4	Performance
14.5.5.4.5	Condensate Cooler Tube Leak	CND-5	CFW	4	Performance
14.5.5.4.8	Hotwell Level Control Failure	CND-8	CFW	4	Performance
14.5.5.6.3	Failure of Individual Rod Raise Relay	CRD-3	CRD	4	Performance
14.5.5.6.4	Failure of Individual Rod Lower Relay	CRD-4	CRD	4	Performance
14.5.5.6.5	Stuck Rod	CRD-5	CRD	4	Performance
14.5.5.6.6	Dropped Rod	CRD-6	CRD	4	Performance
14.5.5.6.7	Failure of Clutch Power Supply	CRD-7	CRD	4	Performance
14.5.5.6.8	Rod Ejection	CRD-8	CRD	4	Performance
14.5.5.7.9	Charging Line Leak Outside Containment	CVC-9	CVC	2	Performance
14.5.5.8.2	Main Condenser Tube Leak	CWS-2	CWS	2	Performance
14.5.5.9.2	Diesel Generator Fuel Transfer Pump Discharge Leak	DSG-2	DSG	1	Performance
14.5.5.9.8	Diesel Generator Failure to Start	DSG-8	DSG	1	Performance
14.5.5.11.1	4160 VAC Bus Fault	EDS-1	EDS	1	Performance
14.5.5.11.2	480 VAC Bus Fault	EDS-2	EDS	1	Performance
14.5.5.11.3	125 VDC Bus Fault	EDS-3	EDS	1	Performance
14.5.5.11.4	120 VAC Instrument Bus Failure	EDS-4	EDS	1	Performance
14.5.5.11.6	480 VAC Supply Transformer Fault	EDS-6	EDS	1	Performance
14.5.5.11.11	Switchyard Line Fault	EDS-11	EDS	1	Performance
14.5.5.11.12	Switchyard Breaker Fault	EDS-12	EDS	1	Performance
14.5.5.12.1	EHC Fluid System Leak on Accumulator	EHC-1	EHC	4	Performance
14.5.5.12.6	Load Limit Potentiometer Failure	EHC-6	EHC	4	Performance
14.5.5.13.1	SGLS Logic Matrix Failure	ESF-1	ESF	3	Performance
14.5.5.13.2	CPHS Logic Matrix Failure	ESF-2	ESF	3	Performance
14.5.5.13.5	PPLS Logic Matrix Failure	ESF-5	ESF	3	Performance

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Appendix B: Schedule for Performance and Operability Tests

Test Number	Test Title	Test I.D.	Assoc. System	Test Cycle	Test Type
14.5.5.13.10	SIAS Logic Actuation Signal Failure	ESF-10	ESF	3	Performance
14.5.5.13.12	OPLS Logic Matrix Failure	ESF-12	ESF	3	Performance
14.5.5.14.2	Main Feedwater Header Leak	FDW-2	CFW	4	Performance
14.5.5.14.3	Main Feedline Leak Upstream of the FCV	FDW-3	CFW	4	Performance
14.5.5.14.5	Main Feedline Leak Inside Containment	FDW-5	CFW	4	Performance
14.5.5.16.1	Feedwater Heater Tube Leak	FWH-1	FWH	2	Performance
14.5.5.17.1	Voltage Regulator Failure	GEN-1	GEN	4	Performance
14.5.5.17.4	Field Breaker failure	GEN-4	GEN	4	Performance
14.5.5.18.1	Main Steam Line Break Inside Containement	MSS-1	MSS	3	Performance
14.5.5.18.3	Main Steam Line Break outside Containment	MSS-3	MSS	3	Performance
14.5.5.18.5	Main Steam Line Isolation Valve Failure	MSS-5	MSS	3	Performance
14.5.5.18.6	Main Steam Line to AFW Pump Leak	MSS-6	MSS	3	Performance
14.5.5.18.7	Main Steam Header Leak	MSS-7	MSS	3	Performance
14.5.5.19.2	Wide Range Power Supply Failure	NIS-2	NIS	2	Performance
14.5.5.19.7	Power range Power Supply Failure	NIS-7	NIS	4	Performance
14.5.5.20.4	Pressurizer Steam Space Leak	PRS-4	PRS	2	Performance
14.5.5.20.5	Pressurizer PORV Failure	PRS-5	PRS	2	Performance
14.5.5.20.9	Pressurizer Level Instrumentation Failure	PRS-9	PRS	[illegible]	Performance
14.5.5.21.1	RCP Lube Oil Cooler Leak	RCP-1	RCP	2	Performance
14.5.5.21.3	RCP Radial Bearing Failure	RCP-3	RCP	2	Performance
14.5.5.21.9	Reactor Coolant Pump Lower Seal failure	RCP-9	RCP	2	Performance
14.5.5.22.1	RCS Loop Leak	RCS-1	RCS	2	Performance
14.5.5.22.3	Fuel Failure	RCS-3	RCS	2	Performance
14.5.5.24.1	Failure of Interposing Relay	RPS-1	RPS	1	Performance
14.5.5.24.2	RPS Power Supply Failure	RPS-2	RPS	1	Performance
14.5.5.24.3	Failure of APD Positive Limit Calculator	RPS-3	RPS	1	Performance
14.5.5.25.2	Main Feedwater Master Controller Failure	RRS-2	RRS	1	Performance
14.5.5.25.7	Steam Dump Quick Opening Solenoid Failure	RRS-7	RRS	1	Performance
14.5.5.26.3	Raw Water Supply Line Break	RWS-3	RWS	2	Performance
14.5.5.27.2	Shutdown Cooling Heat Exchanger Inlet Header Leak	SDC-2	SDC	3	Performance
14.5.5.30.1	Tube Rupture	SGN-1	SGN	3	Performance
14.5.5.30.2	Reference Leg Leak	SGN-2	SGN	4	Performance

Cycle 1=1991/95/99 Cycle 2=1992/96/2000 Cycle 3=1993/97/2001 Cycle 4=1994/98/2002

Appendix B: Schedule for Performance and Operability Tests

Test Number	Test Title	Test I.D.	Assoc. System	Test Cycle	Test Type
14.5.5.31.5	Safety Injection Tank Gas Space Leak	SIS-5	SIS	3	Performance
14.5.5.32.3	Stator Cooling Water Pump Suction Line Leak	GEN-6	GEN	2	Performance
14.5.5.33.1	Main Turbine Lube Oil Reservoir Leak	TUR-1	TUR	4	Performance
14.5.5.33.5	Main Turbine High Vibration	TUR-5	TUR	4	Performance
14.5.5.33.6	Turning Gear Failure	TUR-6	TUR	1	Performance
14.5.5.34.2	Gas decay Tank Leak	WDS-2	WDS	2	Performance
Multiple Malfunction Tests	——	——	——	——	——
14.5.5.35.1	LOCA with Loss of Offsite Power & One D/G Failure			3	Performance
14.5.5.35.2	Inadvertent PORV Opening with Loss of Offsite Power			3	Performance
——	and one D/G Failure	——	——	——	——
14.5.5.35.3	Inadvertent PORV Opening with LOFW, Loss of one			3	Performance
——	HPSI and one ECCS Train	——	——	——	——
14.5.5.35.4	LOFW, with Loss of Offsite Power, One HPSI Pump and			3	Performance
——	one ECCS Train	——	——	——	——
14.5.5.35.5	LOCA with one S/G Isolated, LOSP, and One Diesel			3	Performance
——	Failure	——	——	——	——
Remote Panel Tests	——	——	——	——	——
14.5.6.1	Emergency Auxiliary Feedwater Panel Test			Initial	Hardware
14.5.6.2	Alternate Shutdown Panel Test			Initial	Hardware
14.5.6.3	Neutron Monitoring Panel Test			Initial	Hardware
14.5.6.4	D-2 Diesel Generator and Engine Control Panel Test			Initial	Hardware
Initial Conditions Test	——	——	——	——	——
14.5.7	Initial Condition Checklist			Initial	Operability

Cycle 1=1991/95/99 Cycle 2=1992/96/2000 Cycle 3=1993/97/2001 Cycle 4=1994/98/2002

APPENDIX C

SIMULATOR ADMINISTRATIVE MANUAL

NUCLEAR OPERATIONS DIVISION TRAINING
SIMULATOR ADMINISTRATIVE MANUAL

1.0 INTRODUCTION

The U.S. Nuclear Regulatory Commission enacted changes to Title 10 Part 55 of the Code of Federal Regulations specifying that by 1991, all NRC administered nuclear control room operator and senior operator license examinations shall include an operating exam administered on a full scope control room simulator that has been certified by the NRC. Each utility shall certify to the NRC that their operator license candidates can be operationally examined on a simulator which conforms to the reference plant configuration by which it was designed and on which the operator candidates shall be performing their licensed duties. NRC Regulatory Guide 1.149, NUREG 1258 and American National Standard ANSI/ANS 3.5-1985 clearly delineate the requirements necessary for satisfactory simulator performance and subsequent NRC certification including a description of the methodology to be employed by the NRC for simulator facility evaluation.

This Simulator Administrative Manual addresses the policies and procedures for meeting the requirements of maintaining and utilizing a referen[illegible] p[illegible]t simulator in support the Nuclear Training Organization [illegible] si[illegible]lator training commitments.

2.0 MISSION AND OBJECTIVES

2.1 Mission

The mission of the Simulator Services Department is to continuously maintain a full scope simulator that replicates the Fort Calhoun Station control room and is certified by the Nuclear Regulatory Commission as a training and examination tool.

2.2 Objectives

The objectives of the Simulator Services Department are to:

2.2.1 Achieve a "Standard of Excellence" in the performance of its mission.

2.2.2 Maintain a simulator availability necessary to support Fort Calhoun Station training requirements.

2.2.3 Maintain the simulator's configuration such that the operational and environmental fidelity replicates the Fort Calhoun Station.

2.2.4 Comply with applicable regulatory requirements and satisfy Institute of Nuclear Power Operations (INPO) guidelines while accommodating cost, manpower and schedule constraints.

2.2.5 Maintain a competent, motivated simulator staff that is capable of satisfying the above objectives.

3.0 SOURCES OF REQUIREMENTS AND COMMITMENTS

3.1 <u>Current OPPD Documents and Directions</u>

- o OPPD Policies
- o Updated Final Safety Analysis Report
- o Nuclear Training Administrative Manual
- o Simulator Services Department Administrative Manual
- o Quality Assurance Manual
- o Technical Specifications

3.2 <u>U. S. Nuclear Regulator Commission Regulations, Regulatory Guides and Communications</u>

3.2.1 Title 10 Code of Federal Regulations

- o 10 CFR 55 - Operators' Licenses

3.2.2 Regulatory Guides

- o RG 1.149 - Nuclear Power Plant Simulators for use in Operator Training; endorses and modifies ANSI/ANS 3.5-1985

3.2.3 Office of Nuclear Reactor Regulation Reports

- o NUREG-1021 - Operator Licensing Examiner Standards
- o NUREG-1258 - Evaluation Procedure for Simulation Facilities Certified under 10 CFR 55
- o NUREG-1482 - Nuclear Power Plant Simulators Their Use in Operator Training and Requalification

3.3 Industry Standards

3.3.1 Technical Organizations

- ANSI/ANS 3.5 - Nuclear Power Plant Simulators for Use in Operator Training; endorsed by RG 1.149

3.3.2 Institute of Nuclear Power Operations

- INPO 82-005 - Simulator Training.
- INPO 86-025 - Guidelines for Continuing Training of Licensed Personnel
- INPO 86-026 - Guideline for Simulator Training
- TQ-505 - Institute of Nuclear Power Operations Good Practice, Simulator Configuration Management System

4.0 THE SIMULATOR ADMINISTRATIVE MANUAL

4.1 Purpose

The purpose of the Simulator Administrative Manual is to:

- Facilitate the pursuit of excellence in all simulator activities.
- Ensure consistent, uniform practices.
- Provide guidance to the simulator staff.
- Establish policies for the conduct of simulator operations.

4.2 Scope

This manual applies to the simulator activities that are the responsibility of the Manager - Training.

4.3 Responsibilities

4.3.1 Responsibilities are defined in TOP-33 of the TAM.

4.4 Format

The format used to prepare this manual is that specified by TOP/TAP 28, "Preparation and Approval of Training Organization Polices and Procedures".

This manual is comprised of three primary sections, which are:

- o General
- o Simulator Department Policies (SP)
- o Simulator Administrative Procedures (SA)

4.4.1 General

This section includes an introduction to the manual and presents the mission and objectives of the simulator organization. The overall administrative organization is presented with a general statement of simulator responsibilities of the key leadership positions.

4.4.2 Simulator Policies

This section presents the department policies of simulator organization. The policies are included as individual sections. This allows ease in introduction, revision or revocation of the policy of the simulator organization. The SPs establish policy and the SAs provide procedures for guidance in implementing the policy.

4.4.3 Simulator Administrative Procedures

These administrative procedures are intended to give direction in the implementing policy. In general, for every policy section, there will be a procedure. However, it is conceivable that some policies may be so brief that procedures would not be necessary.

Appendices are included in many of the Simulator Administrative Procedures. These appendices provide additional guidance only. They do not establish requirements.

4.4.4 Revisions

The manual is organized into individual sections to facilitate changes to only one SP or SA when required. This will encourage efforts to keep the manual current and accurate. Thus, the SPs and SAs will be changed when improvements or deficiencies have been identified. Revisions are to be made in accordance with TAP-7.

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