SIMULATOR CERTIFICATION REPORT

FOR THE PRAIRIE ISLAND PLANT

SIMULATION FACILITY

Drafted By: [signature] Date: 2/1/91

Certification Review Panel Review:

Reviewed By: [signature] Date: 2/1/91

Reviewed By: [signature] Date: 2/1/91

Reviewed By: [signature] Date: 2/1/91

Approved By: R. E. Amundson Date: 2/1/91

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990

TABLE OF CONTENTS

APPENDICES

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990

I. INTRODUCTION

The purpose of the Prairie Island Simulator Certification Report is to document the performance of the Prairie Island Simulator in accordance with the requirements provided in 10CFR55.45, Regulatory Guide 1.149 and ANS/ANSI 3.5-1985. This report is in several different sections including information describing the facility, hardware, procedures used, performance testing completed and Configuration Management program for the Simulation Facility hereby certified for the Prairie Island Plant Units 1 and 2.

This report will be issued annually with the initial report issued in February 1991. The first report will describe the simulator as it was delivered, plus any changes made up to the report issue date. Subsequent reports will describe any changes since the last report. A summary of the testing and resolution of discrepancies will be included in each report.

A. Facility Information

Prairie Island Unit 1	Docket Number 50-282 License Number DPR-42
Prairie Island Unit 2	Docket Number 50-306 License Number DPR-60

Licensee: Northern States Power Company

Simulation Facility:

Owner/Operator	Northern States Power Co.
Manufacturer	Singer-Link (presently S-3 Technologies)
Date Available for Training	February 6, 1984
Type of Report	Initial Certification

B. Control Room Information

Figure 1A is a layout of the plant Control Room and Figure 1B is a layout of the simulator area. As can be seen from these figures the two units have a common control room with a Shift Supervisor's office in the center. The controls for each unit are separate except for some shared systems on Panel A. The simulator duplicates the Unit 1 half of the control room plus the necessary portions of the shared systems on Panel A and additionally certain Unit 2 systems with crosstie capability with Unit 1. The differences between the simulator and the plant control room physical arrangement, communications systems, audible environment, lighting, control panels, and systems are presented in Appendix 1.

C. Instructors Interface

The Instructor's Station provides the interface necessary to control and monitor a training session. The major components consist of a CRT with a keyboard, and a control panel. A remote device is also provided which allows the instructor to perform selected functions while not at the Instructor's Control Station.

The control panel and remote device functions are as follows:

Control Panel

1. Emergency Power Off
2. Recorder Power Off
3. Computer Fault/Alarm Silence
4. Step Counter Override
5. Freeze
6. Reset/Ready
7. Switch Check Override
8. Snapshot
9. Fast Time
10. Slow Time
11. Record
12. Replay
13. Backtrack
14. Forward
15. Reverse
16. Annunciator Sound Silence
17. Annunciator Lamp Acknowledge
18. Annunciator Reset
19. ERCS Fault/Override
20. Plant Page Hand Set
21. Simulator Operating Limits/Override

Remote Device

1. Freeze
2. Reset/Run
3. Switch Override
4. Snapshot
5. Backtrack
6. Forward
7. Reverse
8. Replay
9. Annunciator Sound Silence
10. Ten Malfunction Selection Keys

The functions available on the keyboard are presented in Appendix 2. An evaluation of the instructor interface functions available against the requirements in ANS/ANSI 3.5-1985 is presented in Appendix 3.

D. Operating Procedures for the Reference Plant

Controlled copies of the Prairie Island Nuclear Generating Plant (PINGP) Operating Procedures for Unit #1, including Integrated Operations Procedures, System Operations Procedures, Surveillance Procedures, Plant Figures and Curves, System Checklists, Startup Checklists and Emergency Operations Procedures are used on the Prairie Island Simulator. Occasionally draft revisions to selected procedures will be used to validate the procedure revisions prior to use in the plant or to provide the operations personnel training on significant Control Room modifications prior to installation in the plant. The period of use of draft procedures on the simulator is limited to the minimum necessary to provide the training desired by the plant operations personnel in order to maintain control of the simulator configuration.

Unit #2 operating procedures are maintained nearly identical to the Unit #1 procedures, with the major differences being the individual component identification numbers. Some procedures are currently "shared" procedures, with component numbers for both units included in the steps. In these cases the Unit #2 component numbers are enclosed in brackets ([ ]) to separate them from the Unit #1 component numbers. During the normal review/revision process the procedures are being separated to provide individual unit specific procedures. Efforts are made to maintain the procedures identical during all revisions with the only exception being the unique component identification.

Most operating procedures are located on the same shelves in the simulator as they are in the plant control room. The exceptions to this are the procedures which are kept in the Shift Supervisor's office in the plant. These procedures (eg. Startup Checklists, System Descriptions and Special Operating Procedures) are kept in locations on the simulator convenient to the operators. The appearance of the procedures is duplicated by using the same binders as those used in the plant control room.

Administrative procedures and references provided in the Unit #1 control room are also available in the simulator area. Appendix 11 contains a list of the documents which are available on the simulator.

E. Changes Since Last Report

None - Initial Certification Report

II. SIMULATOR DESIGN DATA

A. The simulator design database is composed of three parts:

1. The initial database consists of the documents and data sent to Singer-Link which were used to design, construct and test the simulator. This consisted of required plant drawings, technical manuals and collected plant data (control board pictures, plant process computer printouts, startup test results, etc.). This data was archived following receipt of the simulator and completion of the final acceptance testing. Lists of these documents are available at the Prairie Island Training Center on microfilm. Following delivery of the simulator a review was performed to determine which plant modifications had been included in the design data base.

2. Modifications and additions to the simulator database, as changes are made on the simulator, are documented in the simulator records. The simulator record files contain the following documents:

   Simulator Change Packages
   Modification Reviews
   Setpoint Change Reviews
   Simulator Hardware Drawings
   Simulator Procedures
   Simulator Correspondence
   Simulator Performance Tests
   Simulator Design Review Committee Meeting Minutes
   Simulator Change Index
   Modification Tracking Log
   Discrepancy Reports
   Simulator Improvement Requests
   Initial Condition Updates Form
   Benchmarking Files
   Simulator Work Requests

3. Several of the documentation files included in each simulator change package are kept updated as living documents. These include the Final Design Specification, which includes the model source code, all design assumptions, and the system simulation drawings; wire lists, and several system specific documentation files (DAADS).

The accumulation of all these records plus the current plant drawings and technical manuals (essentially updates of the original information which was sent to Singer-Link) composes the current simulator design database.

III. SIMULATOR TESTING

A. Simulator Performance Testing

A Factory Acceptance Test was conducted at the vendor facilities (Singer-Link) of the completed simulator from 8/83 until 11/83. Much of this test was repeated on site from 1/84 until 2/6/84. This test verified accurate modeling of all included plant systems and also verified correct performance of all available malfunctions. This testing was conducted by Prairie Island licensed personnel and produced a large number of discrepancies which were largely corrected by Singer-Link. All discrepancies resulting from this testing have been corrected or determined to not be significant to training.

Simulator Procedure #11 addresses Performance Testing and requires that performance testing be repeated if simulator changes result in significant simulator configuration or performance variations.

B. Simulator Operability Testing

The simulator operability testing consists of two basic parts: the Simulator Annual Test and the Malfunction testing.

1. Simulator Annual Test

An outline of the annual simulator testing is included in Appendix 5 and abstracts of the annual test procedures are included as Appendix 6. The first annual test was completed in 1989 and will be completed annually. This test includes all testing required for simulator certification except for the required malfunction testing.

2. Simulator Malfunction Testing

Malfunction testing includes testing of all available malfunctions (with two exceptions which have been determined to be inappropriate for training use) over a four year period. Appendix 5 contains the schedule of testing for the next four year cycle. Note that this schedule may change slightly due to additions or deletions of malfunctions.

For this initial certification all malfunction tests were completed during 1989 and 1990. Abstracts of these completed malfunction tests are included as Appendix 8 and samples of the malfunction test procedures are included as Appendix 7. Also included in Appendix 8 is a list of malfunctions which failed their test. The failure of these tests does not adversely affect certification of the simulator since all malfunctions required in ANSI/ANS 3.5-1985 are available. All simulator instructors are informed of these test failures, and the details of the simulator response are available for review prior to conducting training.

Simulator operability testing requirements are included in Simulator Procedure #20. This procedure spells out the requirement for continuous testing of malfunctions over a four year cycle and the annual testing requirements.

In addition to the testing required by ANS/ANSI 3.5-1985 we have determined that testing of all plant Licensee Events is a prudent practice. An index of Licensee Event testing completed is included in Appendix 9.

C. Testing Results Review

Results from all testing completed for simulator certification were reviewed by a panel of experts for agreement with the expected results listed in the procedure and with the results recorded during testing. A list of the experts included in this panel and their qualifications is included as Appendix 4.

IV. CONFIGURATION MANAGEMENT SYSTEM

A. The Configuration Management System for the Prairie Island simulator has five basic objectives:

1. Maintain a current simulator database.

2. Track, resolve and test identified simulator discrepancies.

3. Evaluate, implement and track simulator design enhancements.

4. Identify, track, evaluate, implement and test simulator configuration changes due to reference plant modifications or operating experience.

5. Verify that the current simulator configuration complies with the functional and physical fidelity specifications described in the design database.

B. These objectives are met using a database system based on dBase III+ and extensive documentation of changes made to the simulator hardware or software. The process for tracking, resolution and testing of identified changes to the simulator consists of the following parts:

1. A description of the simulator design database is included in Section II of this submittal.

2. Simulator discrepancies are tracked, resolved and tested following the process spelled out in the simulator procedures. The tracking is performed using a database based on dBase III+. Resolution and testing

of these discrepancies is tracked on this database. Documentation of the resolution and testing is included in the simulator change package which becomes part of the simulator design database.

3. Evaluation of proposed simulator design enhancement is performed by the Simulator Design Review Committee which is made up of representatives from Plant Operations, Operations Training, and the Simulator Group. Once these proposed changes are evaluated they are entered into the tracking system. Further tracking and testing is the same as used for discrepancies.

4. Plant modifications are tracked using the plant modification database. This database is downloaded, from the computer system it resides in, to a Simulator Group PC and then compared against the tracking database maintained. All changes and additions are identified and tracking forms initiated. The tracking database is then updated to match the current plant database. In this way progress on plant modifications and alterations can be tracked and current status can be easily determined. Once the plant modification is completed (identified by a turnover to operations or a closeout), the Simulator Design Review Committee reviews this modification to determine if it requires changes to the simulator. If simulator changes are required a simulator change is initiated and tracked the same as all other simulator changes.

   Changes due to plant operating experience or plant procedure changes are identified by the Request for Training Material Review process. These changes are further reviewed by the Simulator Design Review Committee and if simulator changes are required they are initiated and tracked the same as all other simulator changes.

5. Verification that the current simulator configuration complies with the functional and physical fidelity specifications described in the design database was accomplished by completion of final acceptance testing after delivery of the simulator from Singer-Link. Continuing verification is accomplished by testing of each simulator change prior to use for training, verification of each discrepancy report against plant documents prior to making simulator changes, and testing as required for Simulator Certification.

   Included in the testing for Certification are comparisons against the plant physical configuration (using photographs of the plant controls) periodically during the four year testing cycle.

An evaluation of the Configuration Management requirements included in ANS/ANSI 3.5-1985 as compared to the procedural controls used for the Prairie Island simulator is included in Appendix 10.

APPENDIX 1

Evaluation of Simulator Physical Fidelity and Differences Between Plants and Simulator

---

Summary: The Prairie Island simulator is used for training the operators for both Prairie Island Unit 1 and Unit 2. Due to the similarities in plant construction, nearly identical operating procedures, identical Technical Specifications and single operator's license for both units the Prairie Island simulator is considered a plant specific simulator for both Prairie Island units. Simulator physical design and modelling is referenced to Prairie Island Unit 1.

The differences between the simulator and each unit are identified and justification is presented for all differences which do not adversely affect training. Differences which are identified and which will be corrected are listed with the Discrepancy Report number for tracking uses.

A. Control Room Environment

1. Physical Arrangement

As shown in Figures 1A and 1B the physical arrangement of the simulator duplicates the Prairie Island Unit 1 control room with the following exceptions:

a. The Shift Supervisor's office is similar in appearance from the outside but is used on the simulator for the instructor's booth. None of the equipment located in the plant Shift Supervisor's office is included on the simulator. The manuals located in the plant Shift Supervisor's office are located in a bookshelf against the wall outside the SS office area on the simulator. The stairway leading to the Shift Supervisor's office is located in a different position in the simulator than in the plant.

b. The carpetting in the simulator is a different color than in the plant control room. Additionally the plant flooring consists of carpeted tiles with a black plastic edging while the simulator carpetting does not have this black edging.

c. The simulator room has a flashing red light mounted in the ceiling which will alarm when the Halon fire protection system is actuated. The plant control room does not have this equipment.

APPENDIX 1

d. The simulator room has three ceiling mounted cameras enclosed in black plastic "bubbles" which are used during training to record the trainees responses. This equipment does not exist in the plant control room.

The following differences also exist between the Unit 2 control room physical arrangement and the simulator:

a. Unit 2 control room is a mirror image of the Unit 1 control room. Simulator duplicates the Unit 1 control room.

None of these differences will affect performance of any normal, abnormal or emergency operating procedures. None of these differences will lead to operation or judgement errors on the part of a student during responses to a malfunction or emergency. None of these differences affects any task on the Shift Manager/Supv or Control Room Operator tasklists.

These differences have been reviewed by the Simulator Design Review Committee and are considered minor. The requirements of ANSI/ANS 3.5-1985 Section 3.2.3 are satisfied.

2. Communications Systems

The communications systems available in the plant control room are available and functional on the simulator to the extent that the simulator instructor can communicate over the appropriate system when acting as a remote operator or other support personnel with the following exceptions:

a. The plant radio system is not included on the simulator however a pair of portable radios are available for use which are similar in appearance and function to the portable radios available in the plant.

None of these differences will affect performance of any normal, abnormal or emergency operating procedures. None of these differences will lead to operation or judgement errors on the part of a student during responses to a malfunction or emergency. None of these differences affects any task on the Shift Manager/Supv or Control Room Operator tasklists.

These differences have been reviewed by the Simulator Design Review Committee and are considered minor. The requirements of ANSI/ANS 3.5-1985 Section 3.2.3 are satisfied.

APPENDIX 1

3. Audible Environment

The simulator duplicates the plant control room audible environment as far as noise levels, control rod step counter noise, flow integrator noises, and annunciator horns with the following differences:

a. Turbine noise is not specifically simulated. A partial simulation is included when the door to the Turbine Room is opened on the simulator. However this noise simulation is presently not functioning. This discrepancy is being tracked with DR# 89D-112.

b. Control rod step counter noise is similar to the plant step counter noise; however since the step counters on the simulator have been replaced with electronic LCD counters (in anticipation of the plant modification) the step counter noise is slightly different on the simulator. This difference is being tracked with plant modification # 88L-054.

None of these differences will affect performance of any normal, abnormal or emergency operating procedures. None of these differences will lead to operation or judgement errors on the part of a student during responses to a malfunction or emergency. None of these differences affects any task on the Shift Manager/Supv or Control Room Operator tasklists.

These differences have been reviewed by the Simulator Design Review Committee and are considered minor. The requirements of ANSI/ANS 3.5-1985 Section 3.2.3 are satisfied.

c. The general noise level on the simulator is approximately twice as loud (3dB higher) as the noise level in the plant Control Room. Additionally, the frequencies of noise are different on the simulator since most of the simulator noise is from electronic power supplies whereas the plant Control Room noise is mostly turbine noise. This difference is being tracked with DR# 90D-242.

d. The change in noise level due to a start of the Control Room Air Handlers is not simulated. This difference is being tracked by DR# 91I-002.

These are considered exceptions to the requirements of ANSI/ANS 3.5-1985 Section 3.2.3. These exceptions will not affect performance of any normal, abnormal or emergency operating procedures. Neither will these exceptions lead to operation or judgement errors on the part of a student during responses to a malfunction or emergency. These differences do not affect any task on the Shift Manager/Supv or Control

Room Operator tasklists. These exceptions have been reviewed by the Simulator Design Review Committee and an investigation into the options for correction of these exceptions to improve the training environment on the simulator has been requested. This investigation will be completed and returned to the SDRC by 12/91.

4. Lighting

   a. The simulator light levels are approximately 50% higher than the plant control room light levels. This discrepancy is being tracked with discrepancy report DR# 90D-241.

   b. The emergency lighting equipment on the simulator does not match the emergency lighting equipment in the plant control room. This difference is being tracked with DR# 90I-081.

These are considered exceptions to the requirements of ANSI/ANS 3.5-1985 Section 3.2.3. These exceptions will not affect performance of any normal, abnormal or emergency operating procedures. Neither will these exceptions lead to operation or judgement errors on the part of a student during responses to a malfunction or emergency. These differences do not affect any task on the Shift Manager/Supv or Control Room Operator tasklists. These exceptions have been reviewed by the Simulator Design Review Committee and an investigation into the options available for correction of these exceptions to improve the training environment on the simulator has been requested. This investigation will be completed and returned to the SDRC by 12/91.

B. Control Panels

The Prairie Island simulator contains sufficient operational panels to provide the controls, instrumentation, alarms and other man-machine interfaces to perform the normal plant evolutions specified in ANSI/ANS 3.5-1985 Section 3.1.1 and to respond to the malfunctions specified in Section 3.1.2 for both Prairie Island Unit 1 and Unit 2. The control panels and consoles are designed to duplicate the size, shape, color and configuration of the simulated plant hardware. Attached is a control room layout for the Prairie Island plant. The following panels are simulated:

   a. NIS Panel

   b. Panel F

   c. Panel E

APPENDIX 1

d. Panel D

e. Panel C

f. Panel B

g. Panel A

h. B Train Radiation Monitoring

i. A Train Hot Shutdown Panel

j. B Train Hot Shutdown Panel

k. Rod Drive System Lift Disconnect Switch Box

l. Plant Process Computer Console (RO Station)

m. Panel G

n. Fire Protection Panel

o. Incore Instrumentation Panel

The Prairie Island simulator also models part of the A Train Radiation Monitoring Panel and portions of the local Auxiliary Feedwater Pump controls. In addition portions of the Unit 2 Panel A are modelled to the extent necessary to provide the interactions between units for selected crosstied systems (eg. Cooling Water).

The following panels are located in the plant control room but are not included in the simulator:

a. Seismic Annunciator Panel - located behind Unit 2 control board.

b. Instrumentation Racks - located behind the control board on both Units.

c. Electrical Relay Panel - located behind the Shift Supervisor office.

d. Portions of the A Train Radiation Monitoring Panel - Located behind the Unit 2 control board.

Following is a list of differences between the Prairie Island simulator and Prairie Island Unit 1 and Unit 2 control rooms:

I. Prairie Island Unit 1

1. NIS rack opening above N43 is covered with a blank plate on simulator. This opening is used by I&C

technicians for placement of portable test equipment.

2. Control panels A, B, E and F include a set of four pushbutton switches for control of the motorized overhead T-Bar containing ERCS displays. These pushbuttons are not present on the simulator and the simulator T-Bar is not motorized.

3. The workstation containing the ERCS printers in the simulator is different from the plant due to differences in the simulator room. In addition to this the hold card system printers which are located on this workstation in the plant are not included in the simulator.

4. Several meter scales on the simulator have been revised as part of a plant project standardizing meter scales. Until the plant completes this project the simulator meter scales will be different from the plant meter scales in that the instrument number is printed on the new scale and some minor changes were made in some meter ranges.

5. The manuals and procedures normally kept in the Shift Supervisor's office area are kept on a bookshelf against the outside wall of the instructor's booth on the simulator.

6. The plant Hot Shutdown Panels are located remote from the Control Room. On the simulator these panels are located behind the Control Board. Only the Unit 1 portions of these panels are fully simulated. The Unit 2 portions of these panels are visually simulated.

7. The steam generator power operated relief valve controllers located on the side of the Hot Shutdown Panel are not located in a sheet metal enclosure on the simulator.

8. The control rod drive system step counters have been replaced with electronic LCD counters on the simulator. The plant project to replace the mechanical step counters with electronic LCD step counters is scheduled to be completed in 1991.

9. The portion of the A Train Radiation Monitoring Panel which is included on the simulator is located near the B Train Radiation Monitoring Panel. In the plant the A Train Rad Monitoring Panel is located behind the Unit 2 control board.

APPENDIX 1

10. The Hotwell and Condensate Storage Tank makeup integrators are not included on the simulator. These integrators are located behind the control board in the plant.

11. Several control switch handles are colored red in the plant but are black in the simulator. Red handles for these control switches are not available.

12. The plant has a MIDAS (Meteorological and Dose Assessment System) terminal located behind the Shift Supervisor office. This terminal is not included on the simulator.

13. The plant has moved the page system speaker previously located below annunciator cabinet 47024 to a location above the ceiling grids. This speaker is still located below annunciator cabinet 47024 on the simulator.

II. Unit 2

All differences listed for Unit 1 above also apply to Unit 2. Additionally the following differences exist:

1. The Unit 2 control panels are arranged in a modified mirror image of the Unit 1 control panels. The simulator panels match the layout of the Unit 1 control panels.

2. The Unit 2 annunciators for the intake screenhouse are not included on the simulator. Conversely, the substation alarm included on the simulator does not exist on the Unit 2 annunciators.

3. Component numbering in the simulator does not match the Unit 2 component numbers. In most cases the component numbers differ in only one digit (eg. 1PT-485 vs. 2PT-485 or 47001 vs. 47501).

The four portions of operating panels which are not included in the simulator are not considered significant to training since either no operator actions are expected using these panels or these operator actions are simulated using instructor controls with comm[illegible]ication with the student in a manner similar to that used in the plant control room. None of the differences [illegible]ted between the simulator and Unit 1 or between the simu[illegible] Unit 2 are considered significant since these diff[illegible]ll not affect performance of any normal, abnormal [illegible]ency operating procedures nor will any of these dif[illegible] lead to operation or judgement errors on the pa[illegible] student during responses to a malfunction or em[illegible]. Difference (11) will affect the method used by the Shift Manager to determine affected zones in the process of filling out the emergency notification form, however this function of the Shift Manager is normally included in Emergency Plan Training which is conducted in the EOF using an available MIDAS terminal. These differences do not affect any other task on the Shift Manager/Supv or Control Room Operator tasklists.

These differences have been reviewed by the Simulator Design Review Committee with the conclusion that none of these differences significantly affect training. The requirements of ANSI/ANS 3.5-1985 Section 3.2.3 are satisfied.

C. Systems Simulated and Degree Of Completion

All systems which are controlled from the control room are simulated. The completeness of the modelling is sufficient to perform the normal reference plant evolutions and to respond to the reference plant malfunctions listed in ANSI/ANS 3.5-1985 Sections 3.1.1 and 3.1.2. This includes system interactions and provides and integrated system response.

The systems which are operated from outside the control room are simulated to the degree necessary to perform the reference plant normal evolutions and malfunctions listed in ANSI/ANS 3.5-1985 Sections 3.1.1 and 3.1.2. The trainee is able to interface with the remote activities in a manner similar to the reference plant.

The requirements of ANSI/ANS 3.5-1985 Section 3.2.1 are satisfied.

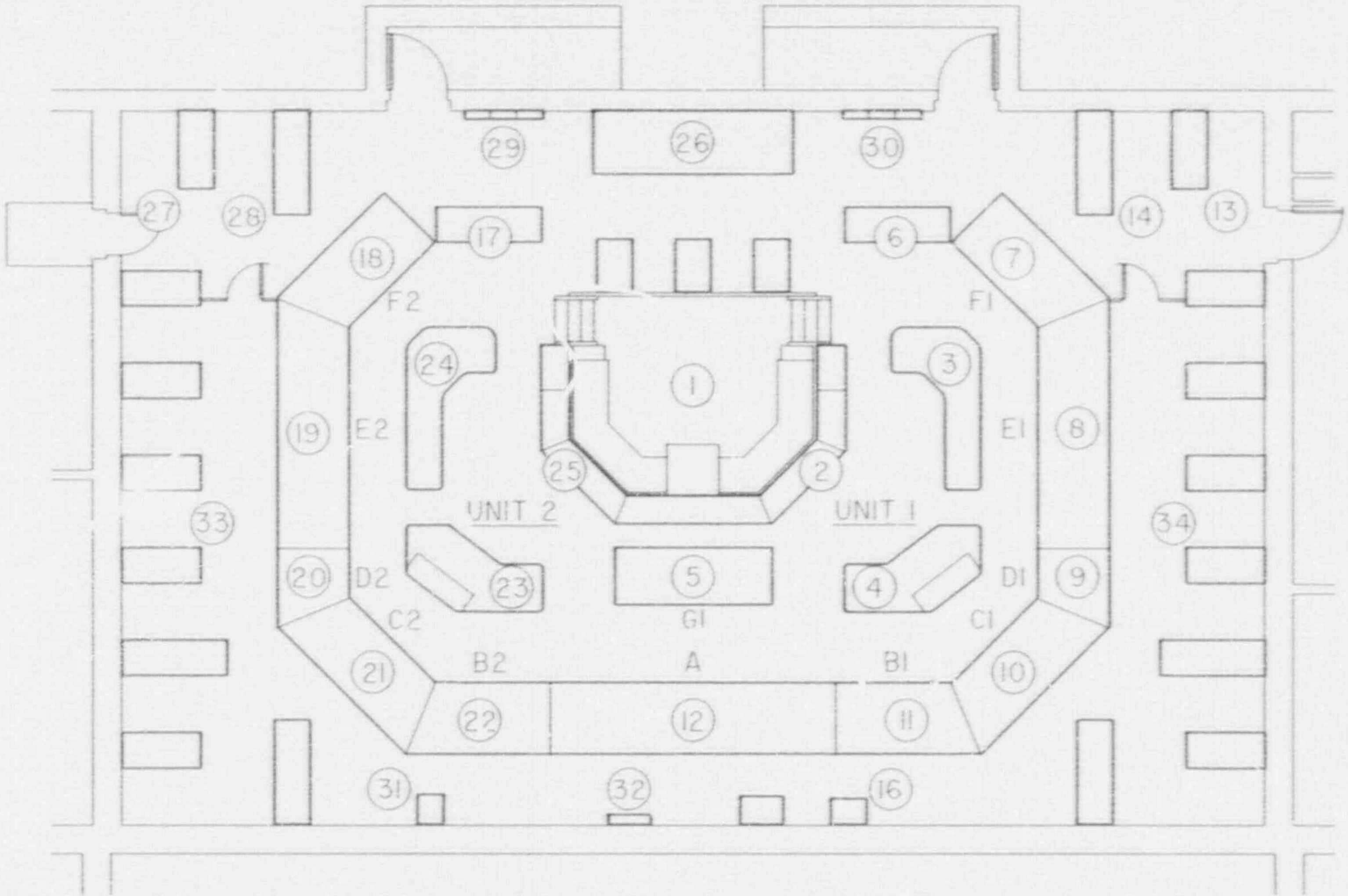
D. Significant Modifications

The following significant modification has been performed on Prairie Island Unit 2 but has not been performed on Unit 1 or on the simulator:

1. Balance Of Plant Annunciator Modification
   This modification was performed on Unit 2 in September 1990 and is scheduled to be completed on Unit 1 in June 1991. The simulator is scheduled to be modified in May 1991.

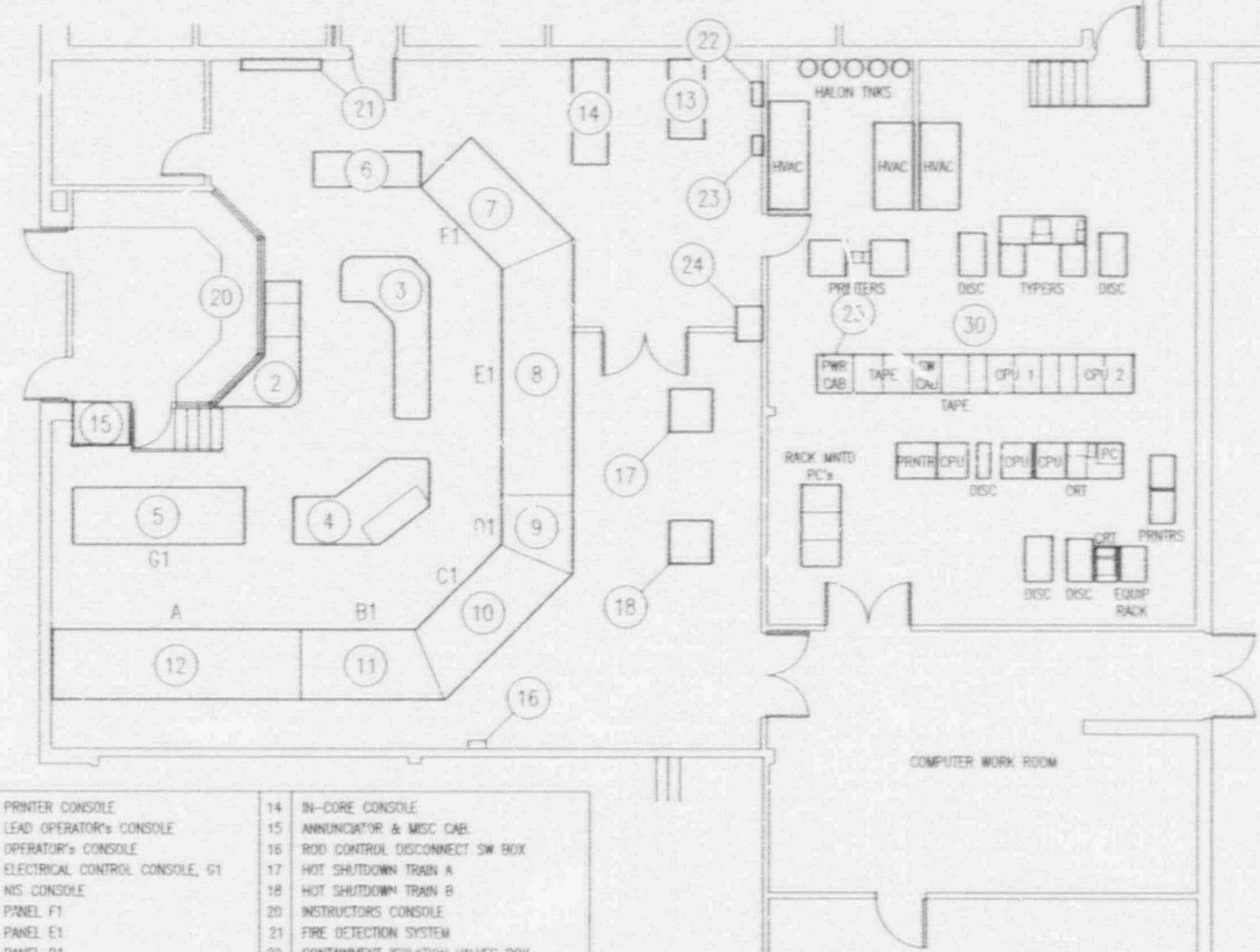
Plant policy has been that significant plant modifications to the control board are performed on the simulator first to allow operator training prior to implementation in the plant. This policy effectively maintains the simulator current with the major plant modifications.

Prairie Island Simulator Certification Report
Appendix I Figure IA
Plant Control Room Layout



1	SHIFT SUPERVISOR'S OFFICE	10	PANEL C1	19	PANEL E2	28	INCORE PANEL UNIT 2
2	ERCSS PRINTER CONSOLE	11	PANEL B1	20	PANEL D2	29	FIRE PROTECTION PANEL
3	LEAD OPERATOR'S CONSOLE	12	PANEL A	21	PANEL C2	30	FIRE PROTECTION PANEL
4	OPERATOR'S CONSOLE	13	RADIATION MONITOR TRAIN B	22	PANEL B2	31	ROD CONTROL DISCONNECT SWITCH BOX
5	ELECTRICAL PANEL G1	14	INCORE PANEL UNIT 1	23	OPERATOR'S CONSOLE	32	SEISMIC ANNUNCIATOR PANEL
6	NIS PANEL UNIT 1	15		24	LEAD OPERATOR'S CONSOLE	33	REACTOR CONTROL RACKS UNIT 2
7	PANEL F1	16	ROD CONTROL DISCONNECT SWITCH BOX	25	PRINTER CONSOLE	34	REACTOR CONTROL RACKS UNIT 1
8	PANEL E1	17	NIS PANEL UNIT 2	26	ELECTRICAL RELAY PANEL		
9	PANEL D1	18	PANEL F2	27	RADIATION MONITOR TRAIN A		

Prairie Island Simulator Certification Report
Appendix 1 Figure 1B
Simulator Layout



2	PRINTER CONSOLE	14	IN-CORE CONSOLE
3	LEAD OPERATOR's CONSOLE	15	ANNUNCIATOR & MISC CAB.
4	OPERATOR's CONSOLE	16	ROD CONTROL DISCONNECT SW BOX
5	ELECTRICAL CONTROL CONSOLE, G1	17	HOT SHUTDOWN TRAIN A
6	NIS CONSOLE	18	HOT SHUTDOWN TRAIN B
7	PANEL F1	20	INSTRUCTORS CONSOLE
8	PANEL E1	21	FIRE DETECTION SYSTEM
9	PANEL D1	22	CONTAINMENT ISOLATION VALVES BOX
10	PANEL C1	23	CONTAINMENT FAN COILS BOX
11	PANEL B1	24	RAD MONITOR MISC. RACK
12	PANEL A	25	POWER CABINET
13	RADIATION MONITOR (RM)	30	COMPUTER COMPLEX

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990
APPENDIX 2

INSTRUCTORS INTERFACE CAPABILITIES

Simulation Options

- Backtrack
- Fast Time
- Slow Time
- Instrument Noise
- Trainer Hardware Test (DORT)
- Switch Check Misalignments Display

Initial Conditions Selection
Snapshot Selection
Backtrack Time Selection
Replay Rate Selection

Malfunction Control
Simulator Operating Limits Display
Self Triggered Malfunctions Control
I/O Override Control
Meteorological Data Control

System Overrides

EG200	EG TEMP XTMR
FW200	COND FLW XTMR
FW201	CDSR HW XTMR
FW202	11A FW LEVEL XTMR
FW203	12A FW LEVEL XTMR
FW204	11B FW LEVEL XTMR
FW205	12B FW LEVEL XTMR
FW206	13A FW LEVEL XTMR
FW207	13B FW LEVEL XTMR
FW208	15A FW LEVEL XTMR
FW209	15B FW LEVEL XTMR
MS200	1B MS LEVEL XTMR
MS201	2B MS LEVEL XTMR
MS202	1A MS LEVEL XTMR
MS203	2A MS LEVEL XTMR
MS204	1B RHDT LEVEL XTMR
MS205	2B RHDT LEVEL XTMR
MS206	1A RHDT LEVEL XTMR
MS207	2A RHDT LEVEL XTMR
MS208	1B RHDT LEVEL XTMR
MS209	2B RHDT LEVEL XTMR
MS210	1A RHDT LEVEL XTMR
MS211	2A RHDT LEVEL XTMR

System Overrides (Cont'd)

NI200	DELTA I OUTPUT N41
NI201	DELTA I OUTPUT N42
NI202	DELTA I OUTPUT N43
NI203	DELTA I OUTPUT N44
RH200	RH FLOW XTMR
RX200	RCS PRESSURE XTMR
RX201	RCS PRESSURE XTMR
RX202	RCS PRESSURE XTMR
RX203	RCS PRESSURE XTMR
RX204	PRZR LVL XTMR
RX205	PRZR LVL XTMR
RX206	SG LEVEL XTMR
RX207	SG LEVEL XTMR
RX208	AUCTIONEERED T_{AVG}
RX209	FW FLOW XTMR
RX210	FW FLOW XTMR
RX211	FW FLOW XTMR
RX212	FW FLOW XTMR
RX213	11/12 MS PRESSURE XTMR
RX214	11 MS PRESSURE XTMR
RX215	11 MS PRESSURE XTMR
RX216	12 MS PRESSURE XTMR
RX217	12 MS PRESSURE XTMR
RX218	1ST STAGE PRESS XTMR
RX219	11 MS FLOW XTMR
RX220	11 MS FLOW XTMR
RX221	12 MS FLOW XTMR
RX222	12 MS FLOW XTMR
RX223	11 STM FLOW XTMR
RX224	12 STM FLOW XTMR
RX225	11 FEED FLOW XTMR
RX226	12 FEED FLOW XTMR
RX227	11 FEED TEMP XTTR
RX228	12 FEED TEMP XTTR
RX229	FW HDR PRESSURE XTMR
RX230	FW HDR PRESSURE XTMR
RX231	11 SG WR LEVEL XTMR
RX232	12 SG WR LEVEL XTMR
VC200	VC PRESSURE XTMR
VC201	VC TEMPERATURE XTMR
VC202	VC FLOW XTMR
VC203	VC FLOW XTMR

Variable Setpoints

CH300	CH I CNMT HI PRESS
CH301	CH II CNMT HI PRESS
CH302	CH IV CNMT HI PRESS
CH303	CH II CNMT HIHI PRESS
CH304	CH III CNMT HIHI PRESS
CH305	CH IV CNMT HIHI PRESS
CH306	CH I CNMT HIHI PRESS
CH307	CH II CNMT HIHI PRESS
CH308	CH IV CNMT HIHI PRESS
CH309	CH II CNMT HIHI PRESS
CH310	CH III CNMT HIHI PRESS
CH311	CH IV CNMT HIHI PRESS
MS300	11 SG SAFETY
MS301	11 SG SAFETY
MS302	11 SG SAFETY
MS303	11 SG SAFETY
MS304	11 SG SAFETY
MS305	12 SG SAFETY
MS306	12 SG SAFETY
MS307	12 SG SAFETY
MS308	12 SG SAFETY
MS309	12 SG SAFETY
NI300	IR N35 PWR ABOVE P-6
NI301	IR N36 PWR ABOVE P-6
NI302	PR N41 PWR ABOVE P-8
NI303	PR N42 PWR ABOVE P-8
NI304	PR N43 PWR ABOVE P-8
NI305	PR N44 PWR ABOVE P-8
NI306	PR N41 PWR ABOVE P-9
NI307	PR N42 PWR ABOVE P-9
NI308	PR N43 PWR ABOVE P-9
NI309	PR N44 PWR ABOVE P-9
NI310	PR N41 PWR ABOVE P-10
NI311	PR N42 PWR ABOVE P-10
NI312	PR N43 PWR ABOVE P-10
NI313	PR N44 PWR ABOVE P-10
NI314	SR N31 HI FLUX TRIP
NI315	SR N32 HI FLUX TRIP
NI316	IR N35 HI FLUX TRIP
NI317	IR N36 HI FLUX TRIP
NI318	PR N41 LO RNG HI FLUX TRIP
NI319	PR N42 LO RNG HI FLUX TRIP
NI320	PR N43 LO RNG HI FLUX TRIP
NI321	PR N44 LO RNG HI FLUX TRIP
NI322	PR N41 HI RNG HI FLUX TRIP

Variable Setpoints (Cont'd)

NI323	PR N42 HI RNG HI FLUX TRIP
NI324	PR N43 HI RNG HI FLUX TRIP
NI325	PR N44 HI RNG HI FLUX TRIP
NI326	PR N41 POS RATE TRIP
NI327	PR N42 POS RATE TRIP
NI328	PR N43 POS RATE TRIP
NI329	PR N44 POS RATE TRIP
NI330	PR N41 NEG RATE TRIP
NI331	PR N42 NEG RATE TRIP
NI332	PR N43 NEG RATE TRIP
NI333	PR N44 NEG RATE TRIP
RC300	PRZR SAFETY
RC301	PRZR SAFETY
RP300	CH 2 P-7 TURB PRESS
RP301	CH 3 P-7 TURB PRESS
RP302	AUTO ROD WITHDRAWAL BLOCK P-2
RP303	BUS 11 UV TRIP
RP304	BUS 12 UV TRIP
RP305	BUS 11 UF TRIP
RP306	BUS 12 UF TRIP
RP307	A LOOP CH I RC LO FLOW TRIP
RP308	A LOOP CH II RC LO FLOW TRIP
RP309	A LOOP CH III RC LO FLOW TRIP
RP310	B LOOP CH I RC LO FLOW TRIP
RP311	B LOOP CH III RC LO FLOW TRIP
RP312	B LOOP CH IV RC LO FLOW TRIP
RP313	CH I PRZR LO PRESS TRIP
RP314	CH II PRZR LO PRESS TRIP
RP315	CH III PRZR LO PRESS TRIP
RP316	CH IV PRZR LO PRESS TRIP
RP317	CH I PRZR HI PRESS TRIP
RP318	CH II PRZR HI PRESS TRIP
RP319	CH III PRZR HI PRESS TRIP
RP320	CH I PRZR LO PRESS SI
RP321	CH II PRZR LO PRESS SI
RP322	CH III PRZR LO PRESS SI
RP323	CH I PRZR HI LVL TRIP
RP324	CH II PRZR HI LVL TRIP
RP325	CH III PRZR HI LVL TRIP
RP326	LOOP A CH I SG LOLO LVL TRIP
RP327	LOOP A CH III SG LOLO LVL TRIP
RP328	LOOP A CH IV SG LOLO LVL TRIP
RP329	LOOP B CH I SG LOLO LVL TRIP
RP330	LOOP B CH II SG LOLO LVL TRIP
RP331	LOOP B CH IV SG LOLO LVL TRIP

Variable Setpoints (Cont')

RP340	LOOP A CH II LOLO T_{AVG} STM LN ISOL
RP341	LOOP A CH IV LOLO T_{AVG} STM LN ISOL
RP342	LOOP B CH I LOLO T_{AVG} STM LN ISOL
RP343	LOOP B CH III LOLO T_{AVG} STM LN ISOL
RP344	LOOP A CH I SG HI STM FLOW
RP345	LOOP A CH II SG HI STM FLOW
RP346	LOOP B CH III SG HI STM FLOW
RP347	LOOP B CH IV SG HI STM FLOW
RP348	LOOP A CH I SG HI-HI STM FLOW
RP349	LOOP A CH II SG HI-HI STM FLOW
RP350	LOOP B CH III SG HI-HI STM FLOW
RP351	LOOP B CH IV SG HI-HI STM FLOW
RP352	LOOP A CH I SG LOLO STM PRESS SI
RP353	LOOP A CH II SG LOLO STM PRESS SI
RP354	LOOP A CH III SG LOLO STM PRESS SI
RP355	LOOP A CH I SG LOLO STM PRESS SI
RP356	LOOP B CH III SG LOLO STM PRESS SI
RP357	LOOP B CH IV SG LOLO STM PRESS SI
RX300	PRZR HI PRESS PCV-430 INTLK
RX301	PRZR HI PRESS PCV-431 INTLK
RX302	LOAD REJ STM DUMP HI T_{AVG}
RX303	LOAD REJ STM DUMP HIHI T_{AVG}
RX304	TURB TRIP STM DUMP HI/HIHI T_{AVG}
RX305	MASTER PRZR PRESS CONT SETPOINT
TC300	INIT TURB CV POS

Malfunctions and Remote Functions

Component Cooling System

CC01	COMPONENT COOLING WATER PUMP TRIP
CC02	COMPONENT COOLING PUMP FAILS TO START AUTOMATICALLY
CC04	COMPONENT COOLING WATER SUPPLY VALVE TO RCP FAILS CLOSED
CC05	COMPONENT COOLING WATER SYSTEM PIPING RUPTURE
CC06	CCW VALVE FAILURE TO OPEN RHR HEAT EXCHANGER AUTO ON PUMP START
CC08	COMPONENT COOLING SURGE TANK AUTO MAKEUP FAILURE
CC09	SEAL WATER HEAT EXCHANGER LEAK
CC100	RCP CCW SUPPLY ISOL A
CC101	RCP CCW SUPPLY ISOL B
CC102	UNIT 1 - UNIT 2 CCW X CONNECT

Malfunctions and Remote Functions (Cont'd)

Component Cooling System (Con't)

CC103	CC OUTLET TEMP CONTROLLER SETPOINT
CC104	11 RCP COMP CLNT INLT/OUTL BKR
CC105	12 RCP COMP CLNT INLT/OUTL BKR
CC106	11 RCP BRG CLG WTR RETRN
CC107	12 RCP BRG CLG WTR RETRN

Containment/HVAC System

CH01	CONTAINMENT PRESSURE TRANSMITTER FAILURE
CH100	POST LOCA H_2 CONTROL VENT
CH101	POST LOCA H_2 CONTROL IA SUPPLY
CH102	11/13 CONT FAN COIL DAMPER
CH103	12/14 CONT FAN COIL DAMPER
CH104	CONT PURGE CONTROL
CH105	121 CONT PURGE CONTROL
CH106	CNTMT HI PRESS B/S PC-945A
CH107	CNTMT HI PRESS B/S PC-949A
CH108	CNTMT HI PRESS B/S PC-947A
CH109	CNTMT HI-HI PRESS B/S PC-946A
CH110	CNTMT HI-HI PRESS B/S PC-948A
CH111	CNTMT HI-HI PRESS B/S PC-950A
CH112	CNTMT HI-HI PRESS B/S PC-945B
CH113	CNTMT HI-HI PRESS B/S PC-946B
CH114	CNTMT HI-HI PRESS B/S PC-947B
CH115	CNTMT HI-HI PRESS B/S PC-948B
CH116	CNTMT HI-HI PRESS B/S PC-949B
CH117	CNTMT HI-HI PRESS B/S PC-950B
CH118	121 LAUNDRY/LOCKER/FILTER ROOM EXHAUST FANS
CH119	CNMT CHILL WATER SYSTEM
CH120	CAT I ANNUNCIATORS
CH121	FIRE DETECTION ALARMS
CH122	FIRE DETECTION ALARMS
CH123	FIRE DETECTION ALARMS
CH124	FIRE DETECTION ALARMS
CH125	FIRE DETECTION ALARMS
CH126	121/122 CR WTR CHILLER XOVER VLVS
CH127	RAD WASTE BLDG VENT
CH128	11/12 CRDM COIL SUPPLY/RETURN VLVS
CH129	U1 CONTAINMENT ENTRY
CH130	U1 CONTAINMENT EXIT
CH131	11-14 CNTMT FCU COND COLL TK DRN

Malfunctions and Remote Functions (Cont'd)

Cooling Water System

CL01	COOLING WATER PUMP
CL02	DIESEL COOLING WATER PUMP FAILS TO START AUTOMATICALLY
CL03	121 COOLING WATER PUMP FAILS TO START AUTOMATICALLY
CL04	DIESEL COOLING WATER PUMP TRIP
CL06	SAFEGUARDS COOLING WATER SUPPLY PIPING RUPTURE
CL07	COOLING WATER SYSTEM TURBINE BUILDING PIPE RUPTURE
CL08	COOLING WATER LEAK INSIDE CONTAINMENT
CL100	TURB OIL COOLER OUTL TEMP CONTRL SETPOINT
CL101	CL-36-1 TRN A SFGRDS CL WATER MAN VLV
CL102	2CL-36-1 TRN B SFGRDS CL WATER MAN VLV
CL103	11/13 FCU CLG WTR RTN ORF BP VLV LOCAL CS
CL104	11/13 FCU CLG WTR RTN ORF BP VLV LOCAL CS
CL105	12/14 FCU CLG WTR RTN ORF BP VLV LOCAL CS
CL106	12/14 FCU CLG WTR RTN ORF BP VLV LOCAL CS
CL107	12 DSL CLG WTR PUMP LOCAL STOP
CL108	22 DSL CLG WTR PUMP LOCAL STOP

Reactor Core System

CR01	FUEL CLADDING FAILURE
CR02	GROSS FUEL FAILURE
CR03	REACTOR COOLANT SYSTEM CRUD BURST
CR04	FUEL CLADDING FAILURE

Containment Spray System

CS01	CONTAINMENT SPRAY PUMP TRIP
CS02	CAUSTIC ADDITION VALVE FAILURE TO OPEN IN AUTOMATIC
CS03	CONTAINMENT SPRAY PUMP FAILS TO START AUTOMATICALLY
CS100	11 CS SUCTION FROM RHR BKR
CS101	12 CS SUCTION FROM RHR BKR
CS102	CAUSTIC ADD TO 11 CS PUMP ISOL
CS103	CAUSTIC ADD TO 12 CS PUMP ISOL

Malfunctions and Remote Functions (Cont'd)

Circulating Water System

CW01	CONDENSER TUBE LEAK
CW02	CIRCULATING WATER PUMP TRIP
CW03	CIRCULATING WATER PUMP BEARING FAILURE
CW04	CONDENSER TUBES PLUGGED
CW05	CONDENSER TUBE RUPTURE
CW06	TRAVELING SCREEN BLOCKAGE ON APPROACH CANAL
CW07	CONDENSER PIT FLOOD
CW100	RIVER WATER TEMPERATURE
CW101	BYPASS GATES MANUAL CONTROL

Electrical Distribution System

ED01	LOSS OF OFFSITE POWER
ED03	LOSS OF OFFSITE POWER
ED04	FAULT IN UNIT 1 M TRANSFORMER-AUTO TRANSFER
ED05	FAULT IN UNIT 1 M TRANSFORMER-WITH DELAYED TRANSFER
ED06	FAULT IN UNIT SUBSTATION TRANSFORMER
ED07	LOSS OF 125 VDC BUS
ED08	LOSS OF 120 VAC INSTRUMENT BUS
ED09	LOSS OF 4160V BUS
ED10	LOSS OF 480 VAC BUS
ED11	BUS 15 LOAD REJECTION-RESTORATION SEQUENCE TIMER FAILURE
ED12	BUS 16 LOAD REJECTION-RESTORATION SEQUENCE TIMER FAILURE
ED13	VOLTAGE RESTORING SCHEME SEQUENCER FAILURE
ED14	LOSS OF ALL AC
ED15	DEGRADED GRID VOLTAGE
ED16	DEGRADED GRID FREQUENCY
ED100	STA AUX MN XFORMER 20KV DISCONNECTS
ED101	10 BANK TO BUS CT12
ED102	1CT TO BUS CT11
ED103	161 KV BUS 1 TO 10 BANK
ED104	SPRING CREEK 161 KV TO 161 KV BUS 1
ED105	RED ROCK LINE 2/BYRON 345 KV LINE

Malfunctions and Remote Functions (Cont'd)

Electrical Distribution System (Cont'd)

ED106	BYRON 345 KV LINE TO 345 KV BUS 2
ED107	UNIT 2/BLUE LAKE 345 KV LINE
ED108	RED ROCK 345 KV LINE 1 TO 345 KV BUS 2
ED109	SUBSTATION ALARM ANNUNCIATOR RESET
ED110	1R-Y AUX TRANSFMR BUS TIE BKR 1RYBT
ED111	2R-Y AUX TRANSFMR BUS TIE BKR 12RYBT
ED112	1R-X/2R-X BUS TIE BKR 12 RXBT
ED113	1R-X BUS DISCONNECT
ED114	1R-Y BUS DISCONNECT
ED115	2R-X BUS DISCONNECT
ED116	2R-Y BUS DISCONNECT
ED117	480V BUS 130/140 BUS TIE BKR 134BT
ED118	480V BUS 150/160 BUS TIE BKR 156BT
ED119	480V BUS 190/290 BUS TIE BKR 1929BT
ED120	480V BUS 130 SUPPLY BKR 13M
ED121	480V BUS 140 SUPPLY BKR 14M
ED122	480V BUS 150 SUPPLY BKR 15M
ED123	480V BUS 160 SUPPLY BKR 16M
ED124	480V BUS 190 SUPPLY BKR 19M
ED125	4.16KV BUS SUPPLY BKR CT11-1
ED126	4.16KV BUS SUPPLY BKR CT12-7
ED127	4.16KV CLNG TWR BUS TIE BKR CT-BT112
ED128	480V MCC 1T1 ALTERNATE SOURCE
ED129	480V MCC 1T2 ALTERNATE SOURCE
ED130	4.16KV BUS 11 1M XFMR BKR 11-4
ED131	4.16KV BUS 12 1M XFMR BKR 12-4
ED132	4.16KV BUS 13 1M XFMR BKR 13-9
ED133	4.16KV BUS 14 1M XFMR BKR 14-9
ED134	4.16KV BUS 15 1M XFMR BKR 15-7
ED135	4.16KV BUS 13 PUMP OVERLOAD RELAYS RESET
ED136	4.16KV BUS 14 PUMP OVERLOAD RELAYS RESET

Electrical Generation System

EG01	GENERATOR OUTPUT BREAKER FAILS TO OPEN FOLLOWING TURBINE TRIP
EG02	LOSS GENERATOR HYDROGEN COOLING
EG03	LOSS OF OFFSITE POWER
EG05	GENERATOR VOLTAGE REGULATOR FAILURE
EG06	GENERATOR FAULT
EG07	GENERATOR LOSS OF EXCITATION

Malfunctions and Remote Functions (Cont'd)

Electrical Generation System (Cont'd)

EG08	LOSS OF EMERGENCY DIESEL GENERATOR
EG09	EMERGENCY DIESEL GENERATOR FAILS TO START
EG10	EMERGENCY DIESEL GENERATOR OUTPUT BREAKER FAILS OPEN
EG11	EMERGENCY DIESEL GENERATOR LOAD LIMIT FAILURE
EG100	GENERATOR H_2 SUPPLY
EG101	GENERATOR CO_2 SUPPLY
EG102	GENERATOR GAS VENT
EG103	HYDROGEN SIDE SEAL OIL PUMP
EG104	AIR SIDE SEAL OIL PUMP
EG106	D1 LOCAL MCA/SHUTDOWN RESET PB
EG107	D2 LOCAL MCA/SHUTDOWN RESET PB
EG108	GEN XFMR 345 KV DISCONNECTS
EG109	MAIN GENERATOR OUTPUT DISCONNECT LINKS
EG110	AIR SIDE SEAL OIL BACKUP PUMP
EG111	AIR SIDE SEAL OIL BACKUP PUMP
EG112	86-1G/86-1GT RESET
EG113	D1 MECHANICAL LINKAGE TO FUEL RACKS RESET
EG114	D2 MECHANICAL LINKAGE TO FUEL RACKS RESET
EG115	D1 LOCAL ANNUNCIATOR SILENCE PB
EG116	D2 LOCAL ANNUNCIATOR SILENCE
EG117	D1 LOCAL PANEL CS
EG118	D2 LOCAL PANEL CS

Condensate and Feedwater System

FW01	CONDENSATE PUMP TRIP
FW02	13 CONDENSATE PUMP FAILS TO START AUTOMATICALLY
FW03	LOSS OF CONDENSER VACUUM
FW05	CONDENSATE PUMP RECIRC VALVE FAILS OPEN
FW06	CONDENSATE PUMP RECIRC VALVE FAILS CLOSED
FW07	CONDENSATE HOTWELL MAKEUP VALVE FAILS OPEN
FW08	CONDENSER HOTWELL MAKEUP VALVE FAILS CLOSED
FW09	LP FEEDWATER HEATER BYPASS VALVE FAILS OPEN
FW10	CONDENSER HOTWELL LEVEL TRANSMITTER FAILS HIGH
FW11	CONDENSER HOTWELL TRANSMITTER FAILS LOW
FW13	MAIN FEEDWATER PUMP TRIP
FW15	FEEDWATER HP HEATER HIGH LEVEL
FW16	FEEDWATER LP HEATER HIGH LEVEL
FW17	FEEDWATER HP HEATER LEAK
FW18	FEEDWATER LP HEATER LEAK
FW19	FEEDWATER SYSTEM RUPTURE INSIDE CONTAINMENT

Malfunctions and Remote Functions (Cont'd)

Condensate and Feedwater System (Cont'd)

FW20	FEEDWATER SYSTEM LEAKAGE INSIDE CONTAINMENT
FW21	FEEDWATER SYSTEM RUPTURE INSIDE CONTAINMENT UPSTREAM OF CHECK VALVE
FW22	FEEDWATER SYSTEM RUPTURE OUTSIDE CONTAINMENT
FW23	FEEDWATER SYSTEM LEAKAGE OUTSIDE CONTAINMENT
FW24	FEEDWATER PUMP COMMON DISCHARGE HEADER RUPTURE
FW25	FEEDWATER FLOW CONTROL VALVE FAILS TO CLOSE ON FW ISOLATION SIGNAL
FW26	FEEDWATER FLOW CONTROL VALVE FAILS OPEN
FW27	FEEDWATER FLOW CONTROL VALVE FAILS CLOSED
FW28	HEATER DRAIN PUMP TRIP
FW29	HEATER DRAIN TANK LEVEL TRANSMITTER FAILS HIGH
FW30	HEATER DRAIN TANK LEVEL TRANSMITTER FAILS LOW
FW31	HEATER DRAIN PUMP FAILS TO MINIMUM
FW32	AUXILIARY FEEDWATER PUMP TRIP, MOTOR
FW33	AUXILIARY FEEDWATER PUMP TRIP, TURBINE
FW34	AUXILIARY FEEDWATER PUMP FAILS TO START AUTOMATICALLY
FW35	INADEQUATE CONDENSATE TO AUXILIARY FEEDWATER PUMP SUCTION
FW36	AUXILIARY FEEDWATER DISCHARGE LINE RUPTURE INSIDE CONTAINMENT
FW37	AUXILIARY FEEDWATER DISCHARGE LINE RUPTURE OUTSIDE CONTAINMENT
FW38	AUXILIARY FEEDWATER CONTROL VALVE FAILS IN POSITION
FW39	FEEDWATER LINE RUPTURE UPSTREAM OF FW REG VALVES
FW40	COMMON FEEDWATER PUMP SUCTION LINE BLOCKAGE
FW41	FEEDWATER FLOW CONTROL VALVE LEAKAGE
FW100	11-12-13 LP FW HTR BYPASS
FW101	TDAFWP IA ISOL TO CV-31998
FW102	CST XCONNECT
FW103	AFW TO 11 SG CNMT ISO BKR
FW104	AFW TO 12 SG CNMT ISO BKR
FW105	11A-12A-13A FW HTR ISOL
FW106	11B-12B-13B FW HTR ISOL
FW107	14A FW HTR ISOL
FW108	14B FW HTR ISOL
FW109	14A FW HTR BYPASS
FW110	14B FW HTR BYPASS
FW111	COND MAKEUP MANUAL BYPASS
FW112	15A HTR ISOL
FW113	15B FW HTR ISOL

Malfunctions and Remote Functions (Cont'd)

Condensate and Feedwater System (Cont'd)

FW114 15A FW HTR BYPASS
FW115 15B HTR BYPASS
FW116 15A TO 14A HTR RESET PB
FW117 15B TO 14B HTR RESET PB
FW118 COND POLISH SYS BYPASS
FW119 CONDENSER SPRAY SYSTEM
FW120 11 FW PUMP RECIRC VLV
FW121 12 FW PUMP RECIRC VLV

Condensate and Feedwater System (Cont'd)

FW122 COND BYPASS TO CW STANDPIPE, CD-19-1
FW123 IA ISOL 11 FW PUMP RECIR VLV
FW124 IA ISOL 12 FW PUMP RECIR VLV
FW125 11 AFW PUMP RESET PB
FW126 11 FW PMP DSCHG VLV CONTROL SW
FW127 12 FW PMP DSCHG VLV CONTROL SW
FW128 11 FW PMP DSCHG VLV CLOSE LOCAL PB
FW129 11 FW PMP DSCHG VLV OPEN LOCAL PB
FW130 12 FW PMP DSCHG VLV CLOSE LOCAL PB
FW131 12 FW PMP DSCHG VLV OPEN LOCAL PB
FW132 MDAFWP LOW PRESSURE TRIPS OVRD
FW133 21 MDAFW PUMP & CROSS-CONNECT VALVES
FW134 11 AFW PUMP TO 1A STM GEN, MV-32238
FW135 11 AFW PUMP TO 1B STM GEN, MV-32239

Compressed Air System

IA01 LOSS OF SERVICE AIR HEADER
IA02 LOSS OF INSTRUMENT AIR HEADER
IA03 LOSS OF AIR COMPRESSOR
IA100 POLISH AIR TO STATION AIR
IA101 POLISH AIR TO INST AIR
IA102 121 FILTER DRYER BYPASS RESET
IA103 122 FILTER DRYER BYPASS RESET

Main Steam System

MS01 MAIN STEAM LINE RUPTURE INSIDE CONTAINMENT UPSTREAM OF MSIV
MS02 MAIN STEAM LINE RUPTURE OUTSIDE CONTAINMENT UPSTREAM OF MSIV

Malfunctions and Remote Functions (Cont'd)

Main Steam System (Con't)

MS03	MAIN STEAM LINE RUPTURE OUTSIDE CONTAINMENT DOWNSTREAM OF MSIV
MS04	MAIN STEAM LINE LEAK
MS05	MAIN STEAM SAFETY VALVE STICKS OPEN
MS06	GLAND SEAL STEAM REGULATING VALVE FAILS CLOSED
MS07	MOISTURE SEPARATOR - REHEATER TUBE LEAK
MS08	MOISTURE SEPARATOR - REHEATER RELIEF VALVES FAILURE
MS09	MAIN STEAM LINE LEAK INSIDE CONTAINMENT
MS10	MAIN STEAM LINE BREAK ON COMMON SUPPLY LINE TO AFW
MS11	STEAM DUMP VALVE FAILS IN POSITION
MS100	11 SG PORV ISOL
MS101	12 SG PORV ISOL
MS102	11 SG ATMOS STM DUMP ISOL
MS103	11 SG ATMOS STM DUMP ISOL
MS104	12 SG ATMOS STM DUMP ISOL
MS105	12 SG ATMOS STM DUMP ISOL
MS106	COND STM DUMP ISOL
MS107	COND STM DUMP BYPASS ISOL
MS108	1A MSR STM SUP ISOL
MS109	1B MSR STM SUP ISOL
MS110	2A MSR STM SUP ISOL
MS111	2B MSR STM SUP ISOL
MS112	11 SG VENT
MS113	12 SG VENT
MS114	1A MSR CV BYPASS
MS115	1B MSR CV BYPASS
MS116	2A MSR CV BYPASS
MS117	2B MSR CV BYPASS
MS118	MSR STOP CK AND CV-31034 RESET
MS119	HP TURBINE BLADING REMOVED
MS120	LP TURBINE BLADING REMOVED
MS121	1A SG PORV LOCAL CONTROL
MS122	1A SG PORV LOCAL CNTRL VLV POSITION
MS123	1B SG PORV LOCAL CONTROL
MS124	1B SG PORV LOCAL CNTRL VLV POSITION
MS125	HEATING STM SUPPLY TO AUX MAIN STM

Nuclear Instrumentation System

NI01	INCORRECT SOURCE RANGE CHANNEL RESPONSE
NI02	SOURCE RANGE CHANNEL SPIKES
NI03	INTERMEDIATE RANGE CHANNEL IMPROPER RESPONSE
NI04	INTERMEDIATE RANGE CHANNEL IMPROPER COMPENSATION
NI05	IMPROPER POWER CHANNEL RESPONSE

Malfunctions and Remote Functions (Cont'd)

Nuclear Instrumentation System (Cont'd)

NI06	POWER RANGE UPPER CHANNEL IMPROPER RESPONSE
NI07	POWER RANGE LOWER CHANNEL IMPROPER RRESPONSE
NI100	CHANNEL 1 PWR RNG HI Q - HI F B/S
NI101	CHANNEL 2 PWR RNG HI Q - HI F B/S
NI102	CHANNEL 3 PWR RNG HI Q - HI F B/S
NI103	CHANNEL 4 PWR RNG HI Q - HI F B/S
NI104	CHANNEL 1 PWR RNG LO Q - HI F B/S
NI105	CHANNEL 2 PWR RNG LO Q - HI F B/S
NI106	CHANNEL 3 PWR RNG LO Q - HI F B/S
NI107	CHANNEL 4 PWR RNG LO Q - HI F B/S
NI108	CHANNEL 1 INT RNG HI F B/S
NI109	CHANNEL 2 INT RNG HI F B/S
NI110	CHANNEL 1 SOURCE RNG HI F B/S
NI111	CHANNEL 2 SOURCE RNG HI F B/S
NI112	POWER RANGE P-10 B/S NC-41 M
NI113	POWER RANGE P-10 B/S NC-42 M
NI114	POWER RANGE P-10 B/S NC-43 M
NI115	POWER RANGE P-10 B/S NC-44 M
NI116	POWER RANGE P-8 B/S NC-41 N
NI117	POWER RANGE P-8 B/S NC-42 N
NI118	POWER RANGE P-8 B/S NC-43 N
NI119	POWER RANGE P-8 B/S NC-44 N
NI120	INTERM RANGE P-6 B/S NC-35 D
NI121	INTERM RANGE P-6 B/S NC-36 D
NI122	CHANNEL 1 POSITIVE RATE B/S
NI123	CHANNEL 2 POSITIVE RATE B/S
NI124	CHANNEL 3 POSITIVE RATE B/S
NI125	CHANNEL 4 POSITIVE RATE B/S
NI126	CHANNEL 1 NEGATIVE RATE B/S
NI127	CHANNEL 2 NEGATIVE RATE B/S
NI128	CHANNEL 3 NEGATIVE RATE B/S
NI129	CHANNEL 4 NEGATIVE RATE B/S
NI130	CHANNEL 1/2 SOURCE RANGE HI FLUX AT SD SETPOINT
NI131	CHANNEL 1 P9 B/S
NI132	CHANNEL 2 P9 B/S
NI133	CHANNEL 3 P9 B/S
NI134	CHANNEL 4 P9 B/S
NI135	CHANNEL 1 INT RNG ROD BLOCK B/S NC-35E
NI136	CHANNEL 2 INT RNG ROD BLOCK B/S NC-36E
NI137	CHANNEL 1 PWR RNG ROD BLOCK B/S NC-41L
NI138	CHANNEL 2 PWR RNG ROD BLOCK B/S NC-42L
NI139	CHANNEL 3 PWR RNG ROD BLOCK B/S NC-43L
NI140	CHANNEL 4 PWR RNG ROD BLOCK B/S NC-44L

Malfunctions and Remote Functions (Cont'd)

Plant Process Computer System

PC01	ERCS CPU FAILURE
PC02	ERCS DATA CONCENTRATOR LINK TO CPU FAILURE
PC03	ERCS ALRM DISPLAY FAILURE
PC04	ERCS SAS DISPLAY FAILURE
PC05	ERCS CONTROL ROOM PRINTER FAILURE
PC06	ERCS DISK A FAILURE

Reactor Coolant System

RC01	REACTOR COOLANT PUMP TRIP
RC02	REACTOR COOLANT PUMP LOCKED ROTOR
RC03	REACTOR COOLANT PUMP SHAFT SHEAR
RC04	REACTOR COOLANT PUMP SHAFT SHEAR
RC05	REACTOR COOLANT PUMP BEARING FAILURE
RC06	LOSS OF COOLANT ACCIDENT - HOT LEG
RC07	LOSS OF COOLANT ACCIDENT - COLD LEG RCP SUCTION
RC08	LOSS OF COOLANT ACCIDENT - COLD LEG RCP DISCHARGE
RC09	LOSS OF COOLANT ACCIDENT, PRESSURIZER STEAM SPACE
RC10	LOSS OF COOLANT ACCIDENT PRESSURIZER WATER SPACE
RC11	LOSS OF COOLANT ACCIDENT-RTD BYPASS LOOP COLD LEG MANIFOLD
RC12	LOSS OF COOLANT ACCIDENT-RTD BYPASS LOOP RETURN LEG PIPING
RC13	LOSS OF COOLANT ACCIDENT - REACTOR HEAD VENT
RC14	REACTOR COOLANT SYSTEM LEAKS
RC15	REACTOR COOLANT SYSTEM LEAKS
RC16	PRESSURIZER POWER OPERATED RELIEF VALVE FAILS CLOSED
RC17	PRESSURIZER HIGH GAS CONCENTRATION IN VAPOR SPACE
RC18	PRESSURIZER SAFETY VALVE RC-10-1 FAILS OPEN
RC19	PRESSURIZER SAFETY VALVE SEAT LEAKS
RC20	REACTOR COOLANT PUMP OIL LEAK, UPPER RESERVOIR
RC21	REACTOR VESSEL O-RING LEAKAGE
RC22	PRESSURIZER POWER OPERATED RELIEF VALVE LEAKAGE
RC23	STEAM GENERATOR TUBES PLUGGED
RC24	PRESSURIZER SPRAY VALVE FAILS IN POSITION
RC100	PRT PRESSURE CONTROLLER SETPOINT
RC101	LOOP B DRAIN
RC102	REFUELING WATER LEVEL IND
RC103	PRZR SPRAY BYPASS LOOP B
RC104	PRZR SPRAY BYPASS LOOP A
RC105	LOOP A RTD BYPASS ISOL

Malfunctions and Remote Functions (Cont'd)

Reactor Coolant System (Con't)

RC106 LOOP B RTD BYPASS ISOL
RC107 RX VESSEL INNER SEAL LEAKOFF
RC108 RX VESSEL OUTER SEAL LEAKOFF
RC110 PRZR STEAM SPACE SAMPLE
RC111 COLD LEG LEVEL ISOLATION VALVES

Control Rod Drive System

RD01 CONTROLLING ROD BANK FAILS TO MOVE IN MANUAL
RD02 CONTROLLING ROD BANK FAILS TO MOVE IN AUTO
RD03 UNCONTROLLED CONTINUOUS ROD WITHDRAWAL OF CONTROLLING BANK
RD04 UNCONTROLLED CONTINUOUS ROD INSERTION OF CONTROLLING BANK
RD05 CONTROL ROD MISALIGNMENT
RD06 STUCK ROD
RD07 DROPPED ROD
RD08 CONTROL ROD G-3 EJECTED
RD09 ROD POSITION INDICATION FAILS
RD10 INCORRECT ROD SPEED
RD100 11 ROD DRIVE MG
RD101 12 ROD DRIVE MG
RD102 RPI SUPPLY FRM INV 15/FRM PNL 117
RD103 BANK D ROD BLOCK B/S TC-405K
RD104 SET CONTROL BANK A P/A CONV
RD105 SET CONTROL BANK B P/A CONV
RD106 SET CONTROL BANK C P/A CONV
RD107 SET CONTROL BANK D P/A CONV
RD113 INV 115/PANEL 117, CKT 13 POWER TO IRPI STACKS

Residual Heat Removal System

RH01 RESIDUAL HEAT REMOVAL PUMP TRIP
RH02 RESIDUAL HEAT REMOVAL PUMP FAILS TO START AUTOMATICALLY
RH03 RHR HEAT EXCHANGER END BELL LEAKAGE TO ATMOSPHERE
RH04 RHR HEAT EXCHANGER BYPASS VALVE FAILS OPEN
RH05 RHR HEAT EXCHANGER BYPASS VALVE FAILS CLOSED
RH06 RECIRCULATION SUMP SUCTION LINES BLOCKED

Malfunctions and Remote Functions (Cont'd)

Residual Heat Removal System (Cont'd)

RH07	RHR SYSTEM LEAKAGE
RH08	RHR PUMP SEAL FAILURE
RH09	RESIDUAL HEAT REMOVAL RELIEF VALVE FAILURE
RH100	11 RHR HX INLET X-CONN, RH-2-4
RH101	12 RHR HX INLET X-CONN, RH-2-3
RH102	11 RHR HX OUTLET X-CONN, RH-2-6
RH103	12 RHR HX OUTLET X-CONN, RH-2-5
RH104	LOOP A HOT LEG MV-32164 BKR
RH105	LOOP B HOT LEG MV-32230 BKR
RH106	12 RHR PMP DSCHG TO SUMP
RH107	LOOP B RET ISO BKR
RH108	11 RHR HEAT EXCHANGER INLET ISL RH-1-4
RH109	12 RHR HEAT EXCHANGER INLET ISL RH-1-3
RH110	11 RHR (CV-31235) MECHANICAL STOP
RH111	12 RHR (CV-31236) MECHANICAL STOP
RH112	11 RHR PUMP SUCTION VALVE
RH113	12 RHR PUMP SUCTION VALVE
RH114	RHR TO CVCS LETDOWN LINE
RH115	LOOP A HOT LEG MV-32165 BKR
RH116	LOOP B HOT LEG MV-32231 BKR

Reactor Protection System (Cont'd)

RP01	REACTOR TRIP
RP02	FAILURE OF AUTOMATIC REACTOR TRIPS
RP03	FAILURE OF SAFETY SYSTEMS TO ACTUATE
RP04	INADVERTENT ACTUATION OF THE SAFETY INJECTION SYSTEM
RP05	FAILURE OF CONTAINMENT ISOLATION PHASE A TO ACTUATE
RP06	FAILURE OF MSIV'S TO ISOLATE
RP07	MECHANICAL FAILURE OF REACTOR TRIP BREAKERS
RP08	FAILURE OF SAFEGUARDS ACTUATION
RP100	REACTOR TRIP BYPASS BKR TRN A
RP101	REACTOR TRIP BYPASS BKR TRN B
RP102	1 LOW RC FLOW A LOOP B/S FC-411
RP103	2 LOW RC FLOW A LOOP B/S FC-412
RP104	3 LOW RC FLOW A LOOP B/S FC-413
RP105	1 LOW RC FLOW B LOOP B/S FC-414
RP106	3 LOW RC FLOW B LOOP B/S FC-415
RP107	4 LOW RC FLOW B LOOP B/S FC-416
RP108	CHANNEL 1 RCP BKR OPEN B/S
RP109	CHANNEL 2 RCP BKR OPEN B/S
RP110	1 PRZR PRESSURE HI B/S PC-429A
RP111	1 PRZR PRESSURE SI B/S PC-429C

Malfunctions and Remote Functions (Cont'd)

Reactor Protection System (Cont'd)

RP112	1 PRZR PRESSURE SI UNBLOCK B/S PC-429D
RP113	1 PRZR PRESSURE LO B/S PC-429E
RP114	11 STM LOOP LO-LO PRESS B/S PC-468A
RP115	11 STM LOOP LO-LO PRESS B/S PC-469A
RP116	11 STM LOOP LO-LO PRESS B/S PC-482A
RP117	1 PRZR HIGH LVL B/S LC-426A
RP118	2 PRZR HIGH LVL B/S LC-427A
RP119	3 PRZR HIGH LVL B/S LC-428A
RP120	3 PRZR PRESSURE HI B/S PC-431A
RP121	3 PRZR PRESSURE SI B/S PC-431G
RP122	3 PRZR PRESSURE SI UNBLOCKED B/S PC-431I
RP123	3 PRZR PRESSURE LO B/S PC-431J
RP124	4 PRZR PRESSURE LO B/S PC-449A
RP125	1 S/G LO-LO LVL B/S LC-461B
RP126	1 S/G LO-LO LVL B/S LC-472A
RP127	11 STM GEN LO PRESS B/S PC-468B
RP128	1 S/G HI LVL B/S LC-461A
RP129	1 S/G HI LVL B/S LC-472B
RP130	2 S/G LO-LO LVL B/S LC-473C
RP131	11 STM GEN LO PRESS B/S PC-469B
RP132	2 S/G HI LVL B/S LC-473D
RP133	3 S/G LO-LO LVL B/S LC-462A
RP134	11 STM GEN LO PRESS B/S PC-482B
RP135	3 S/G HI LVL B/S LC-462B
RP136	12 STM GEN LO PRESS B/S PC-478B
RP137	11 STM GEN LO PRESS B/S PC-479B
RP138	12 STM GEN LO PRESS B/S PC-483B
RP141	1 HI STM FLOW FC-464A
RP142	1 HI-HI STM FLOW FC-464B
RP143	3 HI STM FLOW FC-474A
RP144	3 HI-HI STM FLOW FC-474B
RP148	AMSAC BLOCK SWITCH
RP149	AMSAC ACTUATION SIGNAL RESET
RP152	CHANNEL 1 BUS 11 UNDERVOLTAGE B/S
RP153	CHANNEL 2 BUS 11 UNDERVOLTAGE B/S
RP154	CHANNEL 3 BUS 12 UNDERVOLTAGE B/S
RP155	CHANNEL 4 BUS 12 UNDERVOLTAGE B/S
RP156	12 STM LOOP LO-LO PRESS B/S PC-483A
RP157	12 STM LOOP LO-LO PRESS B/S PC-478A

Malfunctions and Remote Functions (Cont'd)

Reactor Protection System (Cont'd)

RP158	12 STM LOOP LO-LO PRESS B/S PC-479A
RP159	2 RC LOOP OP DELTA T B/S TC-406A
RP160	2 RC LOOP OP DELTA T B/S TC-406B
RP161	2 RC LOOP OT DELTA T B/S TC-406C
RP162	2 RC LOOP OT DELTA T B/S TC-406D
RP163	1 RC LOOP LO T_{AVG} B/S TC-401F
RP164	1 RC LOOP LO-LO T_{AVG} B/S TC-401D
RP165	2 RC LOOP LO T_{AVG} B/S TC-402F
RP166	2 RC LOOP LO-LO T_{AVG} B/S TC-402D
RP167	OPPS HI PRESSURE B/S PC-419D
RP168	OPPS HI PRESSURE B/S PC-420D
RP169	1 RC LOOP OP DELTA T B/S TC-405A
RP170	1 RC LOOP OP DELTA T B/S TC-405B
RP171	1 RC LOOP OT DELTA T B/S TC-405C
RP172	1 RC LOOP OT DELTA T B/S TC-405D
RP181	2 TURBINE POWER P-7 B/S PC-485A
RP182	3 TURBINE POWER P-7 B/S PC-486A
RP183	11 BUS UNDERFREQUENCY B/S
RP184	11 BUS UNDERFREQUENCY B/S
RP185	12 BUS UNDERFREQUENCY B/S
RP186	12 BUS UNDERFREQUENCY B/S
RP187	2 PRZR PRESSURE HI B/S PC-430A
RP188	2 PRZR PRESSURE SI B/S PC-430E
RP189	2 PRZR PRESSURE SI UNBLOCK B/S PC-430F
RP190	2 PRZR PRESSURE LO B/S PC-430H
RP191	4 S/G LO-LO LVL B/S LC-463C
RP192	4 S/G HI LVL B/S LC-463D
RP193	2 HI STM FLOW FC-465A
RP194	2 HI-HI STM FLOW FC-465B
RP195	4 HI STM FLOW FC-475A
RP196	4 HI-HI STM FLOW FC-475B
RP199	3 RP LOOP OP DELTA T B/S TC-407A
RP200	3 RC LOOP OP DELTA T B/S TC-407B
RP201	3 RC LOOP OT DELTA T B/S TC-407C
RP202	3 RC LOOP OT DELTA T B/S TC-407D
RP203	4 RC LOOP OP DELTA T B/S TC-408A
RP204	4 RC LOOP OP DELTA T B/S TC-408B
RP205	4 RC LOOP OT DELTA T B/S TC-408C
RP206	4 RC LOOP OT DELTA T B/S TC-408D
RP207	3 RC LOOP LO T_{AVG} B/S TC-403F
RP208	3 RC LOOP LO-LO T_{AVG} B/S TC-403D

Malfunctions and Remote Functions (Cont'd)

Reactor Protection System (Cont'd)

RP209 4 RC LOOP LO T_{AVG} B/S TC-404F
RP210 4 RC LOOP LO-LO T_{AVG} B/S TC-404D
RP211 4 S/G LO-LO LVL B/S LC-471B
RP212 4 S/G HI LVL B/S LC-471A

Reactor Control System

RX01 PRESSURIZER SPRAY VALVE FAILS OPEN
RX02 PRESSURIZER SPRAY VALVES PCV-431 A & B FAIL CLOSED
RX03 PRESSURIZER HEATERS FAIL ON
RX04 PRESSURIZER HEATERS FAIL OFF (ALL)
RX05 REACTOR COOLANT LOOP T_H TRANSMITTER FAILS HIGH
RX06 REACTOR COOLANT LOOP T_H TRANSMITTER FAILS LOW
RX07 REACTOR COOLANT T_C TRANSMITTER FAILS HIGH
RX08 REACTOR COOLANT LOOP T_C TRANSMITTER FAILS LOW
RX09 PRESSURIZER LEVEL NARROW RANGE TRANSMITTER FAILS HIGH
RX10 PRESSURIZER LEVEL NARROW RANGE TRANSMITTER FAILS LOW
RX11 PRESSURIZER PRESSURE TRANSMITTER FAILS HIGH
RX12 PRESSURIZER PRESSURE TRANSMITTER FAILS LOW
RX13 REACTOR COOLANT SYSTEM WIDE RANGE PRESSURE TRANSMITTER FAILS HIGH
RX14 REACTOR COOLANT SYSTEM WIDE RANGE PRESSURE TRANSMITTER FAILS LOW
RX15 STEAM GENERATOR LEVEL TRANSMITTER FAILS HIGH
RX16 STEAM GENERATOR LEVEL TRANSMITTER FAILS LOW
RX17 STEAM GENERATOR PRESSURE TRANSMITTER FAILS HIGH
RX18 STEAM GENERATOR PRESSURE TRANSMITTER FAILS LOW
RX19 MAIN STEAM LINE STEAM FLOW TRANSMITTER FAILS HIGH
RX20 MAIN STEAM LINE STEAM FLOW TRANSMITTER FAILS LOW
RX21 MAIN STEAM HEADER PRESSURE TRANSMITTER FAILURE
RX22 FEEDWATER CONTROLLER OUTPUT FAILURE
RX23 FEEDWATER LINE FLOW TRANSMITTER FAILS HIGH
RX24 FEEDWATER LINE FLOW TRANSMITTER FAILS LOW
RX25 TURBINE FIRST STAGE PRESSURE TRANSMITTER FAILS HIGH
RX26 TURBINE FIRST STAGE PRESSURE TRANSMITTER FAILS LOW
RX27 STM GEN FEEDWATER INLET TEMPERATURE TRANSMITTER FAILS HIGH
RX28 STM GEN FEEDWATER INLET TEMPERATURE TRANSMITTER FAILS LOW
RX29 FEEDWATER HEADER PRESSURE TRANSMITTER FAILS HIGH
RX30 FEEDWATER HEADER PRESSURE TRANSMITTER FAILS LOW
RX31 STEAM GENERATOR WIDE RANGE LEVEL TRANSMITTER FAILS HIGH
RX32 STEAM GENERATOR WIDE RANGE LEVEL TRANSMITTER FAILS LOW

Malfunctions and Remote Functions (Cont'd)

Reacto· Control System (Con't)

RX33	STEAM GENERATOR FEEDWATER CONTROL SYSTEM FAILS TO MANUAL
RX34	ADFCS MAIN FLOW CONTROL VALVE OUTPUT CARD FAILURE
RX35	ADFCS BYPASS FLOW CONTROL VALVE OUTPUT CARD FAILURE
RX100	PRZR HTR GROUP B
RX101	IMP PRESS ROD BLOCK B/S PC-485C
RX102	IMP PRESS STM DUMP B/S PC-486C
RX103	1 PRZR HI PRESS PORV B/S T/P-429B
RX104	2 PRZR HI PRESS PORV B/S PC-430B
RX105	3 PRZR HI PRESS PORV B/S PC-431B
RX106	4 PRZR HI PRESS PORV B/S T/P-449B
RX107	PRZR LO PRESS B/U HTRS B/S PC-431E
RX108	ADFCS SIGNAL SELECTOR LOGIC RESET
RX109	ADFCS LOSS OF WIDE RANGE LEVEL LOGIC RESET

Steam Generator System

SG01	STEAM GENERATOR TUBE LEAK
SG02	STEAM GENERATOR TUBE RUPTURE
SG03	STEAM GENERATOR BLOWDOWN CONTROL VALVE FAILS OPEN
SG102	11 SG BD SAMPLE ISO VLV LOCAL CS
SG103	11 SG BD SAMPLE ISO VLV LOCAL CS
SG104	12 SG BD SAMPLE ISO VLV LOCAL CS
SG105	12 SG BD SAMPLE ISO VLV LOCAL CS

Safety Injection System

SI01	BOTH BORIC ACID TANK VALVES FAIL TO OPEN IN AUTO
SI02	SI LOOP A COLD LEG INJ CHECK VALVE FAILURE
SI03	BORIC ACID TANK VALVE FAILS TO CLOSE ON LOW-LOW LEVEL IN THE PRESELECTED BORIC ACID TANK IN AUTO
SI04	SAFETY INJECTION PUMP TRIPS
SI05	SAFETY INJECTION PUMP FAILS TO START AUTOMATICALLY
SI06	SI ACCUMULATOR LEAKAGE
SI07	SI ACCUMULATOR CHECK VALVE LEAKAGE
SI08	SI ACCUMULATOR RELIEF VALVE LEAKAGE
SI09	SI COLD LEG INJ LINE RUPTURE INSIDE OF THE ANNULUS
SI100	11/121 BAST SUPPLY TO SIS
SI101	SI TEST LINE
SI102	BA BLENDER TO RWST
SI103	11/12 SI PMP DISCHG X-CONN
SI104	11 SI PUMP DISCHARGE VLV
SI105	12 SI PUMP DISCHARGE VLV

Malfunctions and Remote Functions (Cont'd)

Safety Injection System (Con't)

SI106 BA SPLY TO SI PMPS (32083) BKR
SI107 11 SI SUCTION FROM RHR BKR
SI108 12 SI SUCTION FROM RHR BKR
SI109 SI TO COLD LEGS CNMT ISO BKR
SI110 SI TO LOOP B COLD LEG BKR
SI111 SI TO LOOP A COLD LEG BKR
SI112 11 ACCUM OUTL VLV BKR
SI113 12 ACCUM OUTL VLV BKR
SI114 SI PUMP SUCITON VALVE, SI-15-5

Turbine Control System

TC01 TURBINE STOP VALVE FAILS TO CLOSE WHEN REQUIRED
TC02 TURBINE STOP VALVE FAILS CLOSED
TC03 TURBINE CONTROL SYSTEM CYCLING OUTPUT
TC04 TURBINE CONTROL VALVE FAILS OPEN
TC05 TURBINE CONTROL VALVE FAILS CLOSED
TC06 REACTOR PROTECTION SYSTEM FAILS TO TRIP TURBINE
TC07 TURBINE CONTROL INTERCEPT VALVE FAILS CLOSED
TC08 TURBINE CONTROL FAILURE DURING TURBINE ROLL
TC09 TURBINE CONTROL FAILURE CAUSING TURBINE RUNBACK
TC10 TURBINE CONTROL FAILURE CAUSING AN INCREASE IN POWER WITHOUT DEMAND
TC11 COMPLETE TURBINE TRIP FAILURE
TC12 TURBINE TRIP
TC13 ELECTRICAL HYDRAULIC CONTROL PUMP TRIP
TC14 TURBINE CONTROL VALVE FAILS IN POSITION
TC100 TURBINE PEDESTAL TRIP
TC101 CHANNEL 2 TURB AUTO STOP B/S
TC102 CHANNEL 3 TURB AUTO STOP B/S
TC103 CHANNEL 4 TURB AUTO STOP B/S
TC104 TURBINE LEFT STOP VLV CLOSED B/S
TC105 TURBINE RIGHT STOP VLV CLOSED B/S

Turbine System

TU01 LOSS OF TURBINE LUBE OIL SUPPLY
TU02 TURBINE GENERATOR VIBRATION

Malfunctions and Remote Functions (Cont'd)

Chemical and Volume Control System

VC01	REACTOR COOLANT PUMP #1 SEAL FAILURE
VC02	REACTOR COOLANT PUMP #2 SEAL FAILURE
VC04	POSITIVE DISPLACEMENT CHARGING PUMP TRIP
VC05	STUCK OPEN CHARGING PUMP RELIEF VALVE
VC06	REGENERATIVE HEAT EXCHANGER LEAKAGE
VC07	LETDOWN HEAT EXCHANGER LEAKAGE TO ATMOSPHERE
VC08	LETDOWN HEAT EXCHANGER TUBE RUPTURE TO CCW SYSTEM
VC09	LETDOWN LINE LEAKAGE INSIDE CONTAINMENT
VC10	CHARGING PUMP COMMON DISCHARGE HEADER RUPTURE
VC11	CHARGING LINE LEAKAGE INSIDE CONTAINMENT
VC12	EMERGENCY BORATION VALVE STUCK OPEN
VC13	LETDOWN LINE RELIEF VALVE FAILURE
VC14	VOLUME CONTROL TANK RELIEF VALVE FAILURE
VC19	LOSS OF AIR TO CHARGING PUMP SPEED CONTROLLER
VC20	CCW RETURN FROM LETDOWN HEAT EXCHANGER FAILS CLOSED
VC21	REACTOR COOLANT PUMP THERMAL BARRIER TUBE FAILURE
VC100	11 RCP SEAL INJ THROTTLE VLV
VC101	12 RCP SEAL INJ THROTTLE VLV
VC102	11 RCP STANDPIPE FILL
VC103	12 RCP STANDPIPE FILL
VC104	11/12 MB DEMIN INLET
VC105	11 BAST BORON CONCENTRATION
VC107	11/12 DEBORATING DEMIN
VC108	RWST PUMP SUCTION SELECTOR
VC109	MANUAL BORATE FROM RWST
VC110	BLENDER BYPASS
VC111	VCT PURGE TO HIGH LVL LOOP
VC112	RMU TO CHG PUMP SUCTION
VC113	11 CHG PUMP SPEED REMOTE
VC114	12 CHG PUMP SPEED REMOTE
VC115	13 CHG PUMP SPEED REMOTE
VC116	11/12 LETDOWN FILTER OUTLET
VC117	BORON CONCENTRATION
VC118	LETDOWN FILTERS BYPASS
VC119	H_2 TO VCT
VC120	SEAL WTR RTRN ISOL
VC121	11 BAST LEVEL
VC122	121 BAST LEVEL
VC123	11 RX MAKEUP TK FILL ISOL
VC124	12 RX MAKEUP TK FILL ISOL

Malfunctions and Remote Functions (Cont'd)

Chemical and Volume Control System (Cont'd)

VC125	11 MIX BED IX BORON CONC
VC126	12 MIX BED IX BORON CONC
VC127	11 DEBORATE IX BORON CONC
VC128	12 DEBORATE IX BORON CONC
VC129	EMERGENCY BORATION VALVE
VC130	CHARGING TO LP B B-P
VC131	11 RCP LEAKOFF FLOW XMITTER B-P
VC132	12 RCP LEAKOFF FLOW XMITTER B-P
VC133	11 RCP SEAL B-P
VC134	12 RCP SEAL B-P

Waste Disposal System

WD100	ANN SMP PMP DSCH VLV TO CNTMT MV-32228
WD101	ANN SMP PMP DSCH VLV TO CNTMT MV-32228
WD102	CONT SMP A PMP DSCH VLV TO ARTD SMP TK
WD103	CONT SMP A PMP DSCH VLV TO ARTD SMP TK
WD104	11 RHR PIT SMP PMP DSCH VLV WL-87-1
WD105	12 RHR PIT SMP PMP DSCH VLV WL-87-2
WD106	LOCAL RESET PB 54700-08
WD107	RCDT FILTER INLET AND B-P VLVS
WD108	PURIFICATION JUMPER ISOL VLVS

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990

APPENDIX 3

INSTRUCTOR INTERFACE CAPABILITIES EVALUATION

10CFR 55.45, Regulatory Guide 1.149 and ANS/ANSI 3.5-1985 were reviewed to determine all requirements for certification of a plant referenced simulator. Following are all the requirements related to simulator capabilities and a discussion of the capabilities of the Prairie Island simulator which meets this requirement.

A. Normal Operations Capability:

"The simulator shall be capable of simulating continuously, and in real time, plant operations of the reference plant." [ANS-3.5-1985 3.1.1]

The Prairie Island simulator is capable of simulating normal plant operations using the reference plant procedures. This capability is tested during the annual test section 2.1. These operations are verified to be simulated in real time during the annual test section 3.

B. Minimum Normal Evolution Capability:

"The minimum evolutions that the simulator shall be capable of performing, using only operator action normal to the reference plant, are as follows: " [ANS-3.5-1985 3.1.1]

"Plant startup - cold to hot standby. The starting conditions shall be cold shutdown conditions of temperature and pressure. Removal of the reactor vessel head is not a required condition for simulation." [ANS-3.5-1985 3.1.1.1]

"Nuclear startup from hot standby to rated power." [ANS-3.5-1985 3.1.1.2]

"Turbine startup and generator synchronization. " [ANS-3.5-1985 3.1.1.3]

"Reactor trip followed by recovery to rated power." [ANS-3.5-1985 3.1.1.4]

"Operations at hot standby." [ANS-3.5-1985 3.1.1.5]

"Load changes." [ANS-3.5-1985 3.1.1.6]

"Plant shutdown from rated power to hot standby and cooldown to cold shutdown conditions."
[ANS-3.5-1985 3.1.1.8]

"Core performance testing such as plant heat balance, determination of shutdown margin, and and measurement of reactivity coefficients and control rod worth using using permanently installed instrumentation."
[ANS-3.5-1985 3.1.1.9]

"Operator conducted surveillance testing on safety related equipment or systems."
[ANS-3.5-1985 3.1.1.10]

The Prairie Island simulator is capable of the listed normal operations using plant procedures and operator action normally performed in the reference plant; with all outplant actions normally performed in the reference plant, performed by the instructor. These normal operations are verified during the annual test section 2.1.

"Startup, shutdown and power operations with less than full reactor coolant flow.
[ANS-3.5-1985 3.1.1.7]

This evolution is not allowed by Prairie Island procedures and operations above 10% power with less than full Reactor Coolant flow are not possible. Therefore this capability does not apply to the Prairie Island plant or the Prairie Island simulator. The Prairie Island simulator accurately simulates the plant response to loss of Reactor Coolant flow.

C. Plant Malfunction Capabilities:

"The simulator shall be capable of simulating in real time, abnormal and emergency events including malfunctions to demonstrate inherent plant response and automatic plant control functions."

The Prairie Island simulator is capable of simulating, using malfunctions, abnormal and emergency events which demonstrate plant response and automatic control functions. These are verified to be simulated in real time during the annual test section 3.

APPENDIX 3

"Where operator actions are a function of the degree of severity of the malfunction ... the simulator shall have adjustable rates for the malfunction of such a range to represent the plant malfunction conditions."

The Prairie Island simulator has many malfunctions with variable severities. The range of these variable malfunctions has been chosen to allow selection by the instructor to mimic postulated plant malfunction conditions.

"The remaining events shall consist of a variety of malfunctions associated with the electrical, auxiliary, engineered safety features systems, steam systems, reactor coolant system, and instrumentation and control systems."

"The malfunctions listed below shall be included:" [ANS-3.5-1[illegible] 3.1.2]

(1) Loss of Coolant
(a) significant PWR steam generator leaks
(b) inside and outside primary containment
(c) large and small reactor coolant breaks including demonstration of saturation conditions
(d) failure of safety and relief valves

(2) Loss of instrument air to the extent that the whole system or individual headers can lose pressure and effect the plant's static or dynamic performance

(3) Loss or degraded electrical power to the station, including loss of offsite power, loss of emergency power, loss of emergency generators, loss of power to the plant's electrical distribution buses and loss of power to the individual instrumentation buses (AC as well as DC) that provide power to control room indication or plant control functions affecting the plant's response

(4) Loss of forced coolant flow due to single or multiple pump failure

(5) Loss of condenser vacuum including loss of condenser level control

APPENDIX 3

(6) Loss of service water or cooling to individual components

(7) Loss of shutdown cooling

(8) Loss of component cooling system or cooling to individual components

(9) Loss of normal feedwater or normal feedwater system failure

(10) Loss of all feedwater (normal and emergency)

(11) Loss of protective system channel

(12) Control rod failure including stuck rods, uncoupled rods, drifting rods, rod drops, and misaligned rods

(13) Inability to drive control rods

(14) Fuel cladding failure resulting in high activity in reactor coolant ... and the associated high radiation alarms

(15) Turbine trip

(16) Generator trip

(17) Failure in automatic control systems that affect reactivity and core heat removal

(18) Failure of reactor coolant pressure and volume control systems (PWR)

(19) Reactor trip

(20) Main steam line as well as main feed line break (both inside and outside containment)

(21) Nuclear instrumentation failures

(22) Process instrumentation, alarms, and control system failures

(23) Passive malfunctions in systems, such as engineered safety features emergency feedwater systems

(24) Failure of the automatic reactor trip system

(25) Reactor pressure control system failure including turbine bypass failure (BWR)

Table 3A contains a cross reference between these requirements and the specific Prairie Island simulator malfunction numbers. Note that malfunction requirement #25 is specific for BWR plants and therefore not applicable for Prairie Island. Additionally the events required in ANS-3.5-1985 Appendix B Section B.2.2 are tested annually.

"Where applicable to the malfunction the simulator shall provide to the operator the capability of taking action to recover the plant, mitigate the consequences, or both." [ANS-3.5-1985 3.1.2]

The Prairie Island simulator allows the operator to take any action normally performed in the reference plant from the Control Room to recover the plant or mitigate the consequences of a malfunction. Most outplant actions procedurally directed to respond to a malfunction are also supported through the use of remote functions by the instructor. Some malfunctions are not recoverable, however normal actions for these malfunctions would attempt to mitigate their consequences.

D. Modelling Extent

"The simulation shall be capable of continuing until such time that a stable, controllable and safe condition is attained which can be continued to cold shutdown conditions, or until the simulator operating limits ... are reached." [ANS-3.5-1985 3.1.2]

Provided the simulation does not exceed the established operating limits, the Prairie Island simulation can continue to a stable, controllable and safe condition which can be continued to cold shutdown conditions. This capability is tested during the annual test Section 2.2 as part of the test procedure for the required transient tests.

APPENDIX 3

"The simulator shall contain sufficient operational panels to provide the controls, instrumentation, alarms, and other man-machine interfaces to conduct the normal plant evolutions of 3.1.1 ... and respond to the malfunctions of 3.1.2 ..." [ANS-3.5-1985 3.2.1]

The Prairie Island simulator includes all of the panels in the Prairie Island Unit 1 Control Room plus a portion of the Unit 2 Control Room (selected panels which contain shared equipment). Also included are selected Control Room back panels plus selected outplant panels (eg. Hot Shutdown Panels). Additional Control Room back panel capabilities are provided to the instructor using remote functions (eg. Generator lockout reset). All panels on the Unit 1 Control Room are operational and the Unit 2 panels provided are operational as far as their effect on Unit 1. As such, sufficient controls, instrumentation, alarms and other man-machine interfaces are available to perform the required normal evolutions and to respond to the required malfunctions. This capability is verified during the annual test Sections 2.1 and 2.2.

"The inclusion of systems of the reference plant and the degree of simulation shall be to the extent necessary to perform the reference plant evolutions described in 3.1.1 ... and the malfunctions described in 3.1.2. It shall be possible to perform these control manipulations and observe plant response as in the reference plant. This shall include system interactions with other simulated systems and shall provide total system integrated response." [ANS-3.5-1985 3.3.1]

The Prairie Island simulation includes sufficient systems and degree of simulation to perform the required normal plant evolutions, to respond to the required malfunctions and to observe and control plant response as in the reference plant. This includes system interactions and provides correct integrated plant response. This is verified during the annual test Sections 2.1 and 2.2.

"The systems that are operated outside the control room or that provide some input to the simulation models and are necessary to perform reference plant evolutions described in 3.1.1 ... and malfunctions described in 3.1.2 ... shall be simulated. The simulator trainee shall be able to

interface with the remote activity in a similar manner as in the reference plant."
[ANS-3.5-1985 3.3.2]

The systems operated outside the Control Room which are necessary as inputs to the simulation model or are necessary for performance of the normal plant evolutions or malfunctions required are simulated. Outplant actions are performed by the instructor using remote functions available from the instructor's console CRT. Trainee interface with these outplant actions is through use of the telephone system arranged to be as similar to the normal plant interface as possible.

E. Instructor Interface

"The simulator shall possess a minimum capability for storage of 20 initialization conditions. ...and shall include a variety of plant operating conditions, fission product poison concentrations, and various times in core life."
[ANS-3.5-1985 3.4.1]

Table 3B includes a list of the 26 permanent initial conditions (password protected and kept updated by the simulator support group). In addition to these the Prairie Island simulator has 14 initial conditions which are password protected to be used for exam scenarios and Emergency Plan scenarios (but not kept updated when the software is changed). Also the Prairie Island simulator has 60 initial conditions which are temporary (not password protected nor kept updated) to be used for short term saving of conditions of interest or for discrepancy identification for correction. Of these last 60, four initial conditions do not have corresponding plant process computer initial condition sets.

As can be determined from the attached list, the 26 permanent initial conditions consist of a variety of plant conditions, core lives (ZBC, BOC, MOC, EOC, CDC) and fission product poisons (Xenon free, equilibrium Xenon, peak Xenon).

"It shall be possible to conveniently insert and terminate the plant malfunctions specified in 3.1.2 ... The simulator shall be capable of simulating simultaneous or sequential malfunctions,

or both, ... The introduction of a malfunction shall not alert the operator to the impending malfunction in any manner other than would occur in the reference plant. Provisions shall be made for incorporating additional malfunctions ... not included in 3.1.2 ..."
[ANS-3.5-1985 3.4.2]

Malfunctions on the Prairie Island simulator are entered, severity changed, and terminated (when allowed by the specific malfunction) on a dedicated screen on the instructor's console CRT (screen MFS). Up to 16 malfunctions may be entered in any order desired (simultaneously or sequentially) and may be initiated immediately, initiated at a preset time, or initiated by a programmed function key on the remote control unit. Removal of a malfunction has all the options available to initiation of a malfunction. Additionally, variable malfunctions may be ramped up to the selected severity by entering a ramp time. Initiation of a malfunction does not alert the trainee in any manner different from the response of the reference plant.

Additional malfunctions have been added and will continue to be added as identified as desirable by the administrative process in place for this determination.

"The simulator shall have the capability of freezing simulation. ...consideration should be given to incorporation of fast time, slow time, backtrack, and snapshot capabilities."
[ANS-3.5-1985 3.4.3]

The Prairie Island simulator has the capability of freezing simulation, slow time (several choices of slow time rates - 1/2, 1/4, and 1/8 normal), backtrack (up to sixty backtrack intervals - backtrack interval is usually set to once per minute but can be adjusted between 1 and 10 minutes), and snapshots (total of 100 snapshots 60 of which are for general use). Certain parameters can also be run in fast time. The selected parameters are: xenon transients, condenser evacuation, turbine metal temperature, reactor heatup, reactor cooldown, and decay heat.

"The capability shall be provided for the instructor to act in the capacity of auxiliary or other operators remote from the control room." [ANS-3.5-1985 3.4.4]

This capability is provided to the instructor on the Prairie Island simulator using remote functions. All remote functions required to be used during the normal operations procedures and during the emergency operating procedures are available to the instructor. As additional required or desirable remote functions are identified or requested, they are reviewed and incorporated into the software according to the administrative process in place for this determination.

F. Simulator Operating Limits

"In order to avoid negative training which could result from simulator operation during such events, administrative controls or other means shall be provided to alert the instructor when certain parameters approach values indicative of events beyond the implemented model or known plant behavior." [ANS-3.5-1985 4.3]

The Prairie Island simulator has operating limits which are monitored by the software and, when exceeded, the instructor is alerted by an audible alert, a flashing light on the instructor's console and by the simulator entering freeze. The instructor can then call up a screen on the instructor's station CRT (SOL) which identifies which limit(s) was exceeded. The instructor can then override the operating limits and continue from that point. Administrative guidance allows training beyond these limits provided that the response of the simulator is not adversely affecting the training being conducted. These limits are not normally overridden. The specific parameters monitored as operating limits are included in Table 3C. These parameters are revised as determined necessary using the administrative process in place for this determination.

G. Monitoring

"It shall be possible to obtain hardcopy transient data in the form of either plots or printouts for critical parameters during the evolutions of 3.1.1 ...and the malfunctions of 3.1.2 ... This monitoring capability shall provide sufficient parametric and time resolution to determine compliance with the performance criteria of Section 4." [ANS-3.5-1985 4.4]

The Prairie Island simulator has several different monitoring programs available for differing requirements (eg. Emergency Plan data, hardcopy printout, graphical capabilities). The major system specifically incorporated for certification testing is a software package developed by EPRI and modified for use on our system (SATAR). It collects data during a simulator run, then downloads this data to a personal computer for analysis and graphing. This system meets the parametric and time resolution requirements and has been used extensively for collection, analysis, graphing and presentation of certification testing data.

"Simulator performance shall be established by preparing a simulator performance test, conducting the tests, and comparing the simulator's performance with the simulator design data within the requirements of Section 4 ..."

"Testing shall be conducted and a report prepared for each of the following occasions:

(1) Completion of initial construction

(2) If simulator design changes result in significant simulator configuration or performance variations."

[ANS-3.5-1985 5.4.1]

The Prairie Island simulator was built by Singer Company and was ready for training in February 1984. As part of the contract with Singer the simulator underwent extensive testing including Factory Acceptance Tests (ATP). The ATP (Acceptance Test Procedure) met most of the listed requirements (eg. all systems were completely tested and all malfunctions were tested) however since the standard (ANS-3.5-1985) was not yet issued the acceptance criteria included in the standard was not included in the ATP. Since completion of the ATP all changes have included limited testing to verify correct system and malfunction response for the portions of the software which were changed. This level of testing meets the intent of the requirements listed in ANS-3.5-1985.

APPENDIX 3 TABLE 3A

CROSS REFERENCE BETWEEN ANS 3.5 REQUIREMENTS
AND PI SIMULATOR MALFUNCTIONS

2.2 PLANT MALFUNCTIONS

2.2.1 LOSS OF COOLANT

2.2.1.1 STEAM GENERATOR LEAKS
a. SG01 A,B
b. SG02 A,B

2.2.1.2 INSIDE CONTAINMENT
a. RC06 A,B
b. RC07 A,B
c. RC08 A,B
d. RC09
e. RC10
f. RC11 A,B
g. RC12 A,B
h. RC13
i. RC14
j. RC15
k. RC21
l. RD08
m. VC09

2.2.1.3 OUTSIDE CONTAINMENT
a. RH03
b. RH07
c. RH08
d. VC07

2.2.1.4 LARGE AND SMALL BREAKS INCLUDING DEMONSTRATION OF SATURATION CONDITIONS
a. Several listed above at various severities

2.2.1.5 FAILURE OF SAFETY/RELIEFS
a. RC18
b. RC19
c. RC22
d. RH09
e. VC13
f. VC14

2.2.2 LOSS OF INSTRUMENT AIR
a. IA01
b. IA02

APPENDIX 3 TABLE 3A

2.2.3 LOSS OR DEGRADED ELECTRICAL POWER
- a. ED01
- b. ED03
- c. ED04
- d. ED05
- e. ED06
- f. ED07 A,B
- g. ED08 A,B,C,D,E,F,G,H
- h. ED09 A,B,C,D,E,F,G,H
- i. ED10 A,B,C,D,E,F,G,H,I,J
- j. ED13
- k. ED14
- l. ED15
- m. ED16
- n. EG03
- o. EG06
- p. EG08

2.2.4 LOSS OF FORCED COOLANT FLOW
- a. RC01
- b. RC02
- c. RC03
- d. RC04

2.2.5 LOSS OF CONDENSER VACUUM
- a. FW03
- b. CW02

2.2.6 LOSS OF COOLING TO COMPONENTS
- a. CL06
- b. CL07
- c. CL08

2.2.7 LOSS OF SHUTDOWN COOLING
- a. CC05
- b. CC01 A,B
- c. RH01 A,B
- d. RH06

2.2.8 LOSS OF COMPONENT COOLING
- a. CC01 A,B
- b. CC04 A,B
- c. CC05
- d. CC06

2.2.9 LOSS OF NORMAL FEEDWATER
- a. FW01 A,B,C
- b. FW13 A,B
- c. FW02
- d. FW05
- e. FW06

f. FW09
g. FW15 A,B
h. FW16 A,B,C,D,E,F
i. FW17 A,B
j. FW18 A,B,C,D,E,F,G,H
k. FW19 A,B
l. FW20 A,B
m. FW21 A,B
n. FW22 A,B
o. FW23 A,B
p. FW24
q. FW25 A,B
r. FW26 A,B
s. FW27 A,B
t. FW28 A,B,C
u. FW29
v. FW30
w. FW31 A,B,C
x. FW39 A,B
y. FW40
z. FW41 A,B

2.2.10 LOSS OF ALL FEEDWATER
This malfunction will be a combination of the normal feedwater malfunctions listed above and the emergency feedwater malfunctions following:

a. FW32
b. FW33
c. FW34 A,B
d. FW36
e. FW37

2.2.11 LOSS OF PROTECTIVE SYSTEM CHANNEL

a. CH01 A,B,C,D,E,F
b. NI05 A,B,C,D
c. NI06 A,B,C,D
d. NI07 A,B,C,D
e. RP08 A,B
f. RP02 A,B
g. RX05 A,B,C,D
h. RX06 A,B,C,D
i. RX07 A,B,C,D
j. RX08 A,B,C,D
k. RX09 A,B,C
l. RX10 A,B,C
m. RX11 A,B,C,D
n. RX12 A,B,C,D
o. RX15 A,B,C,D,E,F
p. RX16 A,B,C,D,E,F
q. RX17 A,B,C,D,E,F

r. RX18 A,B,C,D,E,F
s. RX19 A,B,C,D
t. RX20 A,B,C,D
u. RX23 A,B,C,D
v. RX24 A,B,C,D
w. RX25 A,B
x. RX26 A,B

2.2.12 CONTROL ROD FAILURES
a. RD05 1,2,3,4,5,6,7,8,9,10,11,12,13,
14,15,16,17,18,19,20,21,22,23,
24,25,26,27,28,29
b. RD06 A,B,C,D,E,F,G,H,I,J,K,L
c. RD07 A,B,C,D,E,F,G,H,I,J,K,L

2.2.13 INABILITY TO DRIVE CONTROL RODS
a. RD01
b. RD02
c. RD03
d. RD04

2.2.14 FUEL CLADDING FAILURE
a. CR01

2.2.15 TURBINE TRIP
a. TC12
b. TC13 A,B

2.2.16 GENERATOR TRIP
a. EG06
b. EG07

2.2.17 FAILURE OF AUTOMATIC CONTROL SYSTEMS
a. MS11 A,B,C,D,E
b. RD01
c. RD02
d. RD03
e. RD04
f. RD10
g. RX05 A,B,C,D
h. RX07 A,B,C,D
i. RX15 A,B,C,D
j. RX16 A,B,C,D
k. RX17 A,B,C,D,E,F
l. RX18 A,B,C,D,E,F
m. RX19 A,B,C,D
n. RX20 A,B,C,D
o. RX21
p. RX22 A,B
q. RX23 A,B,C,D
r. RX24 A,B,C,D

s. RX25 A,B
t. RX26 A,B

2.2.18 FAILURE OF RCS PRESSURE AND VOLUME
A. Pressure
a. RC16 A,B
b. RC24 A,B
c. RX01 A,B
d. RX02
e. RX03
f. RX04
g. RX11 A B,C,D
h. RX12 A,B,C,D
B. Volume
a. VC19
b. RX09 A,B,C
c. RX10 A,B,C
d. RX05 A,B,C,D

2.2.19 REACTOR TRIP
a. RP01

2.2.20 MAIN FEED/STEAM LINE BREAK
A. Main Steam Line Break
1. Inside Containment
a. MS01 A,B
b. MS09 A,B
2. Outside Containment
a. MS02 A,B
b. MS03 A,B
c. MS04
d. MS10
B. Main Feedwater Line Break
1. Inside Containment
a. FW19 A,B
b. FW20 A,B
c. FW21 A,B
2. Outside Containment
a. FW22 A,B
b. FW23 A,B
c. FW24
d. FW39 A,B

2.2.21 NUCLEAR INSTRUMENTATION FAILURE

a. NI01 A,B
b. NI02 A,B
c. NI03 A,B
d. NI04 A,B
e, NI05 A,B,C,D
f. NI06 A,B,C,D
g. NI07 A,B,C,D

APPENDIX 3 TABLE 3A

2.2.22 PROCESS INSTRUMENT ALARM/CONTROL SYSTEM FAILURE

a. CC06 A,B
b. CC08
c. EG02
d. EG05
e. EG11
f. FW05
g. FW06
h. FW07
i. FW08
j. FW09
k. FW10
l. FW11
m. FW15 A,B
n. FW16 A,B,C,D,E,F
o. FW25 A,B
p. FW26 A,B
q. FW27 A,B
r. FW29
s. FW30
t. FW31
u. MS06
v. RD09
w. RH04
x. RH05
y. RP03 A,B,C,D,E,F,G,H
z. RP04
aa. RP05
ab. RP06
ac. RP08 A,B
ad. RX13 A,B
ae. RX14 A,B
af. SG03 A,B,C,D
ag. TC03
ah. TC08
ai. TC09
aj. TC10
ak. TC11
al. TC01
am. TC02
an. TC04
ao. TC05
ap. TC06
aq. TC07
ar. VC20

2.2.23 PASSIVE MALFUNCTIONS ESF/AFW

a. CC02 A,B
b. CC06 A,B

c. CL02 A,B
d. CL03 A,B
e. CS02 A,B
f. CS03 A,B
g. EG09 A,B
h. EG11 A,B
i. FW34 A,B
j. RH02 A,B
k. RP03 A,B,C,D,E,F,G,H
l. RP05
m. RP06
n. RP07
o. RP08 A,B
p. RP02 A,B
q. SI01
r. SI03 A,B
s. SI05 A,B

2.2.24 FAILURE OF AUTO REACTOR TRIP SYSTEM

a. RP02 A,B
b. RP07

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
APPENDIX 3 TABLE 3B
SIMULATOR PROTECTED INITIAL CONDITIONS

I.C.	TIME IN CYCLE	DATE SHOT	BORON CONC	ROD HEIGHT	XENON	TAVG	PZR PRESS	RX PWR	REMARKS
1	ZBC	12/09/90	2150	ARI	NONE	110	26	30 CPS	TEST IC
2	BOC	12/09/90	1599	ARI	NONE	133	16	30 CPS	COLD S/D, 3% S/D
3	MOC	12/09/90	1448	ARI	NONE	132	14	30 CPS	COLD S/D, 3% S/D
4	BOC	12/09/90	1604	SDO	NONE	322	390	30 CPS	HEATUP IN PROGRESS
5	BOC	12/09/90	1339	SDO	NONE	546	2272	100 CPS	HOT S/D, ECC:1339 PPM @ 100 STEPS ON D
6	BOC	12/09/90	1339	D @ 116	INC	551	2255	5 %	PRIOR TO ROLLING TURBINE
7	BOC	12/09/90	1342	D @ 119	INC	551	2242	5 %	PRIOR TO SYNCHRONIZING GENERATOR
8	BOC	12/09/90	1072	D @ 203	EQUIL	552	2220	51 %	ONE HDT, COND, AND FW PUMP IN SERVICE
9	BOC	12/09/90	950	D @ 215	EQUIL	560	2243	100 %	100% TARGET DELTA I = +0.6
10	MOC	12/09/90	503	D @ 218	EQUIL	560	2242	100 %	100% TARGET DELTA I = -0.9
11	EOC	12/09/90	210	D @ 218	EQUIL	560	2246	100 %	100% TARGET DELTA I = -1.4
12	EOC	12/09/90	221	D @ 155	INC	554	2249	62 %	PWR REDUCTION TO 60% FROM 100% AT 1%/MIN PRIOR TO SECURING MFWP
13	EOC	12/09/90	192	D @ 65	INC	548	2237	22 %	PRIOR TO SEPERATING UNIT
14	EOC	12/09/90	550	SDO	NONE	547	2277	200 CPS	BORATED TO ECC BORON, VAC IN CONDENSER ECC:550 PPM @ 100 STEPS ON D
15	EOC	12/09/90	952	SDO	NONE	346	352	70 CPS	C/D IN PROGRESS, PRIOR TO PLACING RHR IN SERVICE. AT COLD S/D BORON CONC
16	MOC	12/09/90	868	D @ 160	INC	547	2276	11 %	LOAD INCREASE
17	COC	12/09/90	0	D @ 228	EQUIL	557	2241	95 %	COASTDOWN AT EOC
18	MOC	12/09/90	868	D @ 118	NONE	547	2274	1.0E-8	PLANT STARTUP IN PROGRESS
19	MOC	12/09/90	677	D @ 183	INC	552	2242	52 %	LOAD INCREASE; 2 COND, HDT, MFW PUMPS
20	MOC	12/09/90	488	SDO	INC	547	2251	200 CPS	2 HRS FOLLOWING RX TRIP FROM 100% PWR. ECC:488 PPM @ 100 STEPS ON D
21	MOC	12/09/90	507	D @ 210	DEC	558	2237	90 %	LOAD INCREASE
22	EOC	12/09/90	117	SDO	PEAK	548	2265	300 CPS	10 HRS FOLLOWING RX TRIP FROM 100% PWR ECC:117 PPM @ 100 STEPS ON D
23	MOC	12/09/90	502	D @ 188	PEAK	552	2236	52 %	6 HRS FOLLOWING LOAD REDUCTION FROM 100% POWER
24	BOC	12/09/90	1054	D @ 210	DEC	557	2255	78 %	LOAD INCREASE TO 100%
25	MOC	12/09/90	513	D @ 183	INC	555	2247	71 %	LOAD DECREASE
26	ZBC	12/09/90	1402	D @ 95	NONE	547	2274	1.0E-8	POSITIVE ITC, STARTUP IN PROGRESS

APPENDIX 3 TABLE 3C

Simulator Operating Limits

1. RCS Pressure >3107 psig
   (Tech Spec 2.2 basis)

2. Containment Pressure >46 psig
   (FSAR Section 5.2.1.1)

3. Containment Temperature >268 F
   (FSAR Section 5.2.1.1)

4. Primary to Secondary dP >2485 psi
   (FSAR Section 4.3.2.2)

5. Secondary to Primary dP >1100 psi
   (FSAR Section 4.3.2.2)

6. NDT Limit Brittle Fracture - RCS pressure and temperature outside of brittle fracture region of curve in Tech Spec 3.1 (Figure 3.1-1)

7. Steam Cooling / Two Phase Flow parameters:
   - Hot leg flow below natural circulation
   and
   - Rx vessel level below hot leg
   and
   - No SI flow
   and
   - No RHR flow

8. Steam Bubble In Rx Head
   - Pzr steam space flow (out of Pzr)
   and
   - Rx Vessel upper plenum water enthalpy above saturation

9. Rx Vessel Lower Plenum Temperature Limit
   - Temperature in lower plenum should be above core region boiling temperature

These nine conditions will be monitored using the identified parameters and when these conditions are exceeded the SOL alarm will be set. For simple conditions (eg. RCS Pressure) the SOL page on PCM will display the value once the limit is exceeded. However for the complicated conditions the SOL page will only display "TRUE".

Note that considerable time and effort has been expended to enable the model to respond in a correct manner outside of several of these limits (specifically with a steam bubble in the reactor head and with early stages of steam cooling), however since the model has some limitations in responding to these effects, these operating limits must be incorporated.

These operating limits can be overridden to allow training during these plant conditions. This enables training on use of some procedures as long as the simulator response is judged to not adversely affect the training being conducted. The simulator operating limits are not overridden unless these conditions are expected or reached.

APPENDIX 4

Certification Review Panel Members

The Certification Review Panel makeup is spelled out in Simulator Procedure #20. This panel consists of the Lead Simulator Engineer, one member from the Plant Operations group, one member from the Operations Training group and one member from the Simulator Support group. The current membership and their qualifications follow:

Lead Simulator Engineer - Michael Johnson

Educational Background: Bachelor of Electrical Engineering
University of Minnesota 1979

Experience: Eight years as a plant Systems Engineer at the Prairie Island Nuclear Plant

Three years as the Lead Simulator Engineer for the Prairie Island Plant Simulator

Certifications: Prairie Island Senior Reactor License 4/30/85
(License allowed to lapse 12/31/88 due to company decision)

Plant Operations - Robert Held

Educational Background: High School Diploma
Navy Nuclear Power Training

Experience: Twenty-six years nuclear plant experience
Fourteen years as Shift Supervisor at Prairie Island
One year as Operations Liaison with Production Training

Certifications: Prairie Island Reactor Operator License 1974
Prairie Island Senior Reactor Operator License 1977
NSP Basic Instructor Certification

APPENDIX 4

Operations Training - David Reynolds

Educational Background: High School Diploma
Two years Post Secondary Education

Experience: Twenty-two years nuclear plant experience
Over fifteen years training experience
Five and one half years as Operations Training
Supervisor at Prairie Island

Certifications: Prairie Island Senior Reactor Operator
License 3/84 (allowed to lapse 1/90)
NSP Advanced Instructor Certification

Simulator Support Group - Michael Gardzinski

Educational Background: High School Diploma
Two years post secondary education

Experience: Eleven years US Navy Nuclear Plant
Operator/Instructor
One and one half years Nuclear Plant Chemistry Tech Five
years WPPSS Nuclear Instructor Eight and on half years
instructor at Prairie Island

Certifications: NSP Advanced Instructor Certification
Prairie Island Senior Reactor Operator License

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990

APPENDIX 5

FOUR YEAR TESTING SCHEDULE

A. Annual Testing - Following is an outline of the testing to be completed annually:

	REFERENCE ANSI 3.5
PART 1 - STEADY STATE OPERATION	
1.1 100% POWER - IC-9 BOL	B2.1
1.2 75% POWER - IC-24 MOL adjusted to ~75%	B2.1
1.3 25% POWER - IC-13 EOL adjusted to ~25%	B2.1
PART 2 - TRANSIENT OPERATION	
2.1 NORMAL PLANT EVOLUTIONS	
2.1.1 UNIT STARTUP	
2.1.1.1 PLANT HEATUP	3.1.1(1)
2.1.1.2 OPERATIONS AT HOT SHUTDOWN	3.1.1(5)
2.1.1.3 REACTOR STARTUP	3.1.1(2)
2.1.1.4 TURBINE/GENERATOR STARTUP	3.1.1(3)
2.1.1.5 LOAD INCREASE (0% TO 100%)	3.1.1(6)
2.1.2 UNIT SHUTDOWN	
2.1.2.1 PLANT SHUTDOWN (HSD TO CSD)	3.1.1(8)
2.1.2.2 LOAD DECREASE (100% TO 0%)	3.1.1(6)
2.1.3 REACTOR TRIP WITH RECOVERY	3.1.1(4)
2.1.4 CORE PERFORMANCE TESTING	3.1.1(9)
2.1.4.1 CALORIMETRIC	
2.1.4.2 SHUTDOWN MARGIN CALCULATION	
2.1.4.3 PHYSICS TESTING	
2.1.5 OPERATOR SURVEILLANCE TESTS	3.1.1(10)
2.2 TRANSIENT PERFORMANCE TESTS	
2.2.1 MANUAL REACTOR TRIP	B2.2
2.2.2 TRIP OF ALL FEEDWATER PUMPS	B2.2
2.2.3 CLOSURE OF MSIV's	B2.2
2.2.4 TRIP OF ALL RCP's	B2.2
2.2.5 TRIP OF ANY RCP	B2.2
2.2.6 MAIN TURBINE TRIP	B2.2
2.2.7 MAXIMUM RATE POWER RAMP	B2.2
2.2.8 MAXIMUM LOCA WITH LOSS OF OFFSITE POWER	B2.2
2.2.9 MAXIMUM STEAM BREAK	B2.2
2.2.10 SBLOCA THRU PORV WITH NO SI PUMPS	B2.2
2.2.11 LOAD REJECTION FROM 100% (Draft)	B3.2
PART 3 COMPUTER REAL TIME TEST	A3.1

APPENDIX 5

FOUR YEAR TESTING SCHEDULE

B. Periodic Testing - The following testing will be completed over a four year period from 1/1/91 through 12/31/94.

1. Malfunction Tests - A total of 339 tests are currently included. This number will be revised as malfunctions are added, deleted or modified. One quarter of these tests (presently 85 +/-4) will be completed each calendar year.

2. Physical Fidelity Comparisons - The comparisons of the simulator to the plant control room, although not specifically included as tests, will be repeated once every four year cycle. This includes the comparison of photographs of the plant control room to the simulator, light level measurements and noise level measurements. Present plans are to complete these comparisons during 1994.

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
APPENDIX 6 1990

ANNUAL OPERABILITY TESTING ABSTRACT

STEADY STATE TEST - 100% POWER

Description: The purpose of this test was to measure certain plant parameters and compare those parameters to data measured on the simulator. PITC simulator data is compared to both PINGP units. In addition the parameters measured on the simulator are evaluated for stability over a one hour time period.

Date Conducted: 1/11/90

CRP Approval Date: 2/1/91

Initial Conditions: IC-9 (100% Power Beginning of Cycle)

Duration of Test: One Hour

Data Collected: Data was collected for the parameters listed in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program. Additionally, RCS Leakrate and Secondary Calorimetric (heat balance) data was collected.

Description of Baseline Data Used: Plant data is collected using the plant process computer archival retrieval functions.

Deficiencies Identified: Several parameters differed from the plant values by more than 2%. Most of these parameters are variable based on desired plant modes of operation and vary from day to day (eg. Generator vars is adjusted to the desired grid conditions which vary from hour to hour). Some differences were determined to be due to plant maintenance problems (eg. leaking check valve) which are undesirable to model. All differences were reviewed by the Certification Review Panel and determined to be insignificant to training.

ANNUAL OPERABILITY TESTING ABSTRACT

STEADY STATE TEST - 75% POWER

Description: The purpose of this test was to measure certain plant parameters and compare those parameters to data measured on the simulator. PITC simulator data is compared to both PINGP units. In addition the parameters measured on the simulator are evaluated for stability over a one hour time period.

Date Conducted: 1/16/91

CRP Approval Date: 2/1/91

Initial Conditions: IC-24 (78% Power Middle of Cycle). Power level is stabilized at approximately 75% Efforts are made to match the plant power level for which data is available as closely as possible.

Duration of Test: One Hour

Data Collected: Data was collected for the parameters listed in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program. Additionally, RCS Leakrate and Secondary Calorimetric (heat balance) data was collected.

Description of Baseline Data Used: Data is collected using the plant process computer archival retrieval functions. Data points to be collected were determined from a review of ANS/ANSI 3.5-1985 and a survey performed by General Physics Corporation.

Deficiencies Identified: Several parameters differed from the plant values by more than 2%. Most of these parameters are variable based on desired plant modes of operation and vary from day to day (eg. Generator vars is adjusted to the desired grid conditions which vary from hour to hour). Some differences were determined to be due to plant maintenance problems (eg. leaking check valve) which are undesirable to model. All differences were reviewed by the Certification Review Panel and determined to be insignificant to training.

ANNUAL OPERABILITY TESTING ABSTRACT

STEADY STATE TEST - 25% POWER

Description: The purpose of this test was to measure certain plant parameters and compare those parameters to data measured on the simulator. PITC simulator data is compared to both PINGP units. In addition the parameters measured on the simulator are evaluated for stability over a one hour time period.

Date Conducted: 1/18/91

CRP Approval Date: 2/1/91

Initial Conditions: IC-13 (20% Power End of Cycle). Power level is stabilized at approximately 28%. Efforts are made to match the plant power level for which data is available as closely as possible.

Duration of Test: One Hour

Data Collected: Data was collected for the parameters listed in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program. Additionally, RCS Leakrate and Secondary Calorimetric (heat balance) data was collected.

Description of Baseline Data Used: Data is collected using the plant process computer archival retrieval functions. Data points to be collected were determined from a review of ANS/ANSI 3.5-1985 and a survey performed by General Physics Corporation.

Deficiencies Identified: Several parameters differed from the plant values by more than 2%. Most of these parameters are variable based on desired plant modes of operation and vary from day to day (eg. Generator vars is adjusted to the desired grid conditions which vary from hour to hour). Some differences were determined to be due to plant maintenance problems (eg. leaking check valve) which are undesirable to model. All differences were reviewed by the Certification Review Panel and determined to be insignificant to training.

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - NORMAL PLANT EVOLUTIONS

UNIT STARTUP

Description: The purpose of this test is to ensure the PITC Simulator simulates operations from cold shutdown conditions to 100% power operations. This procedure will use the normal plant operating procedures and surveillances for operating guidance. The simulator is expected to simulate all control board evolutions and some required supporting out plant tasks.

Date Conducted: 8/21/90 through 11/20/90

CRP Approval Date: 1/31/91

Initial Conditions: IC 2 (Cold Shutdown, Beginning Of Cycle)

Final Conditions: Simulator in stable 100% Power conditions.

Data Collected: Controlled procedures were used for all plant evolutions. Completed copies of all procedures used were collected.

Description of Baseline Data Used: Controlled plant procedures are used for all steps of this shutdown. Copies of all completed procedures and surveillances are included as records. Ability to correctly complete controlled plant procedures and to achieve stable 100% power conditions indicates acceptable simulator performance.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - NORMAL PLANT EVOLUTIONS

UNIT SHUTDOWN

Description: The purpose of this test is to ensure the PITC Simulator simulates operations from 100% power operations conditions to cold shutdown conditions. This procedure will use the normal plant operating procedures and surveillances for operating guidance. The simulator is expected to simulate all control board evolutions and some required supporting out plant tasks.

Date Conducted: 11/20/90 through 11/21/90

CRP Approval Date: 2/1/91

Initial Conditions: IC-17 (95% Power Coastdown Conditions)

Final Conditions: Simulator in stable Cold Shutdown conditions.

Data Collected: Controlled procedures were used for all plant evolutions. Completed copies of all procedures used were collected.

Description of Baseline Data Used: Controlled plant procedures are used for all steps of this shutdown. Copies of all completed procedures and surveillances are included as records. Ability to correctly complete controlled plant procedures and to achieve stable cold shutdown conditions indicates acceptable simulator performance.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - NORMAL PLANT EVOLUTIONS

REACTOR TRIP WITH RECOVERY

Description: The purpose of this procedure is to test the response of the PITC simulator, during the sequence of events of a reactor trip, subsequent restart of the reactor and load increase to rated power. It is not the intent that other malfunctions be interjected, but to simulate operations under normal conditions. Other portions of the testing program will measure the malfunction abilities of the simulator. This test is designed to meet the requirements of ANSI 3.5 section 3.1.1(4) -"Reactor trip followed by recovery to rated power". The acceptance criteria of ANSI 3.5 section 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 12/19/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-9 (100% Power Beginning of Cycle)

Final Conditions: 100% Power Stable plant conditions.

Data Collected: Controlled procedures were used for all plant evolutions. Completed copies of all procedures used were collected.

Description of Baseline Data Used: Controlled plant procedures are used for all steps of this shutdown. Copies of all completed procedures, checklists and surveillances are included as records. Ability to correctly complete controlled plant procedures and to achieve stable 100% power conditions indicates acceptable simulator performance.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - NORMAL PLANT EVOLUTIONS

CORE PERFORMANCE TESTING

Description: The purpose of this test is to verify that the performance of the Prairie Island Simulator core model matches the plant core performance. This test will measure the plant heat balance (calorimetric), will calculate the shutdown margin at several power levels and will perform Zero Power Physics testing to measure total control rod worth, critical boron concentration and isothermal temperature coefficient at beginning of life. This test is designed to meet the requirements of ANSI 3.5 section 3.1.1.5 "Normal Plant Evolutions". The acceptance criteria were developed from the plant surveillance test procedures (SP 1001, D30, D32).

Date Conducted: 1/1/91

CRP Approval Date: 2/1/91

Initial Conditions: Several for seperate parts of the test:
IC-9 (100% Power Beginning of Cycle)
IC-19 (50% Power Middle of Cycle)
IC-13 (20% Power End of Cycle)
IC-5 (Hot Shutdown Beginning of Cycle)

Final Conditions: Measurements completed.

Data Collected: Measurements of Control Rod Worth, Critical Boron Concentration, Isothermal Temperature Coefficient, Shutdown Margin along with Calorimetric (heat balance) data.

Description of Baseline Data Used: Plant predicted core data and results from low power physics testing during startup.

Deficiences Identified During This Testing: Measurements of total Control Rod Worth differed from the plant predicted values by more than 10%. This difference is due to plant core modifications which have not been incorporated into the simulator. These differences have been judged by the Certification Review Panel to not be significant to training. The simulator core model will be updated to match the plant predicted core data once the plant has achieved the goal of 18 month cycles

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - NORMAL PLANT EVOLUTIONS

OPERATOR SURVEILLANCE TESTS

Description: The purpose of this test is verify that the PINGP safety-related surveillances are able to be completed on the Prairie Island Simulator. This test is designed to meet the requirements of ANSI 3.5 section 3.1 "Normal Plant Evolutions", subsection 3.1.1.10 "Operator conducted surveillance testing on safety-related equipment or systems. The surveillances tested are selected from the PINGP control room lists of surveillances. All surveillances on this list which are completed largely from the Control Room are tested. The criteria for acceptable simulator response was the ability to complete the surveillance as outlined in the test procedure, and all control board responses were within the procedure acceptance criteria.

Date Conducted: Various Dates between 11/13/90 and 11/21/90.

CRP Approval Date: 1/31/91

Initial Conditions: Various depending on the Surveillance procedure requirements.

Final Conditions: Completion of the surveillance procedure.

Data Collected: Completed copies of all Surveillance Procedures detemined to be appropriate for use on the simulator.

Description of Baseline Data Used: Controlled copies of the plant surveillance procedures with their proscribed acceptance criteria.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

MANUAL REACTOR TRIP

Description: The purpose of this test is to test the ability of the PITC simulator to match PINGP conditions, during a manual reactor trip. It is not the intent that other malfunctions be interjected, but to only simulate operations under reactor trip conditions. Other portions of the testing program will measure the malfunction ability of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 - Transient Performance "Manual reactor trip". The acceptance criteria of ANSI 3.5 Appendix B - B.2.2.1, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 12/19/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-10 (100% Power Middle of Cycle)

Final Conditions: Tave stabilizes at or trends to 547 degrees, NIS source ranges are energized, steam generator narrow range levels are on scale and increasing.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

TRIP OF ALL FEEDWATER PUMPS

Description: The purpose of this test is to test the ability of the PITC simulator to match PINGP conditions, during a loss of all feedwater event. It is not the intent that other malfunctions be interjected, but to only simulate operations under loss of feedwater. Other portions of the testing program will measure the malfunction ability of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 - Transient Performance "Simultaneous trip of all feedwater pumps". The acceptance criteria of ANSI 3.5 Appendix B -B2.2.1, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 12/10/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-11 (100% Power End of Cycle)

Final Conditions: RCS pressure reaches the setpoint of the pressurizer power operated relief valves and the pressurizer PORV's lift.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

CLOSURE OF MAIN STEAM ISOLATION VALVES

Description: The purpose of this test is to test the ability of the PITC simulator to match PINGP conditions, during a inadvertent closure of both main steam isolation valves while at 100% reactor power. It is not the intent that other malfunctions be interjected, but to only simulate operations under MSIV closure conditions. Other portions of the testing program will measure the malfunction ability of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 - Transient Performance "Simultaneous closure of all Main Steam Isolation Valves". The acceptance criteria of ANSI 3.5 Appendix B - B.2.2.1, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 12/10/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-11 (100% Power End of Cycle)

Final Conditions: RCS Tavg stabilizes at approximately 552 degrees or steam generator pressure PORV's maintain pressure at 1050psig.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

TRIP OF ALL REACTOR COOLANT PUMPS

Description: The purpose of this test is to test the ability of the PITC simulator to approximate PINGP conditions, during a simultaneous trip of both unit #1 RCP's, which causes a reactor trip. It is not the intent that other malfunctions be interjected, but to only simulate operations under reactor trip conditions. Other portions of the testing program will measure the malfunction ability of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 -Transient Performance "Simultaneous trip of all Reactor coolant pumps ". The acceptance criteria of ANSI 3.5 Appendix B -B.2.2.1, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 11/27/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-11 (100% Power End of Cycle)

Final Conditions: RCS Tave stabilizes at approximately 547 degrees and natural circulation is verified.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

TRIP OF ANY REACTOR COOLANT PUMP

Description: The purpose of this test is to test the ability of the PITC simulator to match PINGP conditions, during a trip of 11 RCP, which causes a reactor trip. It is not the intent that other malfunctions be interjected, but to only simulate operations under reactor trip conditions. Other portions of the testing program will measure the malfunction ability of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 -Transient Performance "Trip of any single r actor coolant pump". The acceptance criteria of ANSI 3.5 Appendix B -B.2.2.1, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 12/10/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-11 (100% Power End of Cycle)

Final Conditions: RCS Tave stabilizes at approximately 547 degrees.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

MAIN TURBINE TRIP

Description: The purpose of this test is to test the ability of the PITC simulator to approximate PINGP conditions, during a Main turbine trip(from maximum power level that does not result in immediate reactor trip). It is not the intent that other malfunctions be interjected, but to only simulate operations under main turbine trip conditions. Other portions of the testing program will measure the malfunction ability of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 - Transient Performance "Main turbine trip". The acceptance criteria of ANSI 3.5 Appendix B -B.2.2.1, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 11/6/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-7 (5% Power Beginning of Cycle)

Final Conditions: RCS Tavg stabilizes at approximately 552 degrees.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

MAXIMUM RATE POWER RAMP

Description: The purpose of this test is to test the ability of the PITC simulator to match PINGP conditions, during a maximum rate power ramp from 100% power down to approximately 75% power and back to 100% power. It is not the intent that other malfunctions be interjected, but to only simulate operations under maximum rate power ramp conditions. Other portions of the testing program will measure the malfunction ability of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 - Transient Performance "Maximum rate power ramp". The acceptance criteria of ANSI 3.5 Appendix B - B.2.2.1, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 12/10/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-10 (100% Power Middle of Cycle)

Final Conditions: RCS Tavg, pressurizer pressure and pressurizer level stabilize.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

MAXIMUM LOCA WITH LOSS OF OFFSITE POWER

Description: The purpose of this test is to test the ability of the PITC simulator to match PINGP conditions, during a maximum break LOCA with a loss of offsite power. It is not the intent that other malfunctions be interjected, but to only simulate operations under these conditions. Other portions of the testing program will measure the other malfunction abilities of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 - Transient Performance "Maximum size reactor coolant system rupture combined with loss of all offsite power". The acceptance criteria of ANSI 3.5 Appendix B -B.2.2.3, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 12/10/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-11 (100% Power End of Cycle)

Final Conditions: RCS pressure stabilizes, containment pressure trends down and SI pumps lose suctiondue to low RWST level.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

MAXIMUM STEAM LINE BREAK

Description: The purpose of this test is to test the ability of the PITC simulator to match PINGP conditions, during a maximum steam line break inside containment. It is not the intent that other malfunctions be interjected, but to only simulate operations under these conditions. Other portions of the testing program will measure the other malfunction abilities of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 - Transient Performance "Maximum size unisolable main steam line rupture". The acceptance criteria of ANSI 3.5 Appendix B - B.2.2.3, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 12/11/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-11 (100% Power End of Cycle)

Final Conditions: RCS pressure recovers, the non-faulted steam generator level recovers and containment pressure trends down.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

SMALL BREAK LOCA THROUGH PRESSURIZER PORV WITH NO SI PUMPS

Description: The purpose of this test is to test the ability of the PITC simulator to match PINGP conditions, during a depressurization due to a stuck open PORV along with both SI pumps disabled. It is not the intent that other malfunctions be interjected, but to only simulate operations under these conditions. Other portions of the testing program will measure the other malfunction abilities of the simulator. This test is designed to meet the requirements of ANSI 3.5 Appendix B section B.2.2 - Transient Performance "Slow primary system depressurization to saturated conditions using pressurizer relief or safety valve stuck open. (Inhibit activation of high pressure Emergency Core Cooling Systems)". The acceptance criteria of ANSI 3.5 Appendix B - B.2.2.4, and 4.2.1 Transient operation (b) and (c) is followed.

Date Conducted: 12/11/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-11 (100% Power End of Cycle)

Final Conditions: RCS pressure reaches saturation conditions as indicated by ICCM and ERCS displays.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

TRANSIENT OPERATION TESTING - TRANSIENT TESTS

LOAD REJECTION FROM 100% POWER

Description: The purpose of this test is to test the ability of the PITC simulator to match PINGP conditions, during a load rejection from 100% power. It is not the intent that any malfunctions be interjected, but only to simulate operations under maximum loss of load conditions. Other portions of the testing program will measure the malfunction ability of the simulator. This test is designed to meet the requirements of 1990 draft of ANSI 3.5 Appendix B section B3.2.1 - Transient Performance "Load rejection from 100% power". The acceptance criteria of 1990 draft of ANSI 3.5 Appendix B - B3.2.2, and 4.1.3.3 Normal Evolutions are followed.

Date Conducted: 12/11/90

CRP Approval Date: 1/31/91

Initial Conditions: IC-10 (100% Power Middle of Cycle)

Final Conditions: RCS Tavg, pressurizer pressure and pressurizer level stabilize.

Data Collected: Data was collected for selected parameters from the list in Table 6A using the SATAR (Simulator Automated Testing And Reverification) program.

Description of Baseline Data Used: Judgement of the Certification Review Panel. Makeup and qualifications of this panel are identified in Appendix 4 of this report.

Deficiences Identified During This Testing: None

ANNUAL OPERABILITY TESTING ABSTRACT

COMPUTER REAL TIME TEST

Description: The purpose of this test is to test the ability of the PITC simulator to perform in real time. Real time is defined (in ANS 3.5) as "...dynamic performance in the same time base relationships, sequences, durations, rates and accelerations as the dynamic performance of the reference plant." To verify real time performance this test verifies that the four executive programs have spare time in all frames to ensure that all frames have time to complete (and therefore frames never are skipped). This verifies real time performance since all the software assumes that the modules run at their allocated frequency. Additionally, four specific tasks, chosen to ensure that each of the four executive programs are tested, are performed and timed to be compared to plant values for task completion time. Finally a selected list of plant surveillance tests are completed all of which time the performance of some plant equipment. These surveillance test results are then compared to the plant results to verify agreement.

Date Conducted: 6/28/90 & 12/31/90

CRP Approval Date: 1/31/91

Initial Conditions: Various depending on the surveillance test requirements.

Final Conditions: Completion of the computer timing test, selected operations and selected surveillance procedures.

Data Collected: Completed surveillance test procedures, completed computer timing test including calculations of spare time and timed simulator response for selected manipulations.

Description of Baseline Data Used: Minimum of five percent spare time in each frame from the computer timing test, selected operations compared to system design values, surveillance results compared to acceptance criteria provided in the surveillance test procedure.

Deficiences Identified During This Testing: None

TABLE 6A
SIMULATOR CERTIFICATION TESTING CRITICAL PARAMETER LIST

Parameter Title		Units	Datapool Variable
Loop Flow	Loop A	%	RCF0400A
	Loop B	%	RCF0420A
Hot Leg Temperature	Loop A	F	RCT450
	Loop B	F	RCT451
Cold Leg Temperature	Loop A	F	RCTCLDA
	Loop B	F	RCTCLDB
Average RCS Temperature - Auct Hi		F	RXTAVGN
Steam Flow	Loop A	#/s	MSFSGA
	Loop B	#/s	MSFSGB
Normal Feedwater Flow	Loop A	#/s	FWFFWSGA
	Loop B	#/s	FWFFWSGB
Aux Feedwater Flow	SG A	#/s	FWFAFSGA
	SG B	#/s	FWFAFSGB
Steam Generator Blowdown Flow	SG A	gpm	SGF0409A
	SG B	gpm	SGF0429A
Core Thermal Power		watts	RCQRXPWR
Neutron Flux	N41	%	NIN0049A
	N42	%	NIN0050A
	N43	%	NIN0051A
	N44	%	NIN0052A
Source Range Monitor	N31	DKCPS	NIN0031A
	N32	DKCPS	NIN0032A
Intermediate Range Monitor	N35	mcA	NIN0035A
	N36	mcA	NIN0036A
Delta I	N41	%	NIQPDIA
	N42	%	NIQPDIB
	N43	%	NIQPDIC
	N44	%	NIQPDID
Control Rod Bank Positions	SDA	Steps	RDSSDA
	SDB	Steps	RDSSDB
	A	Steps	RDC0100A
	B	Steps	RDC0101A
	C	Steps	RDC0102A
	D	Steps	RDC0103A
Wide Range RCS Pressure		psig	RCPI709
Pressurizer Level		%	RCLPZR
Pressurizer Pressure		psia	RCPPZT
Pressurizer Temperature	Liquid	F	RCT0480A
	Steam	F	RCT0481A
Pressurizer Surge Line Temperature		F	RCT0483A
RVLIS Level	Upper Head	%	RCL0452A
	Wide Range	%	RCL0454A
	Dynamic Head	%	RCL0456A
Generator Watts		MW	EGQ0340A
Generator Vars		MVars	EGY0346A
Generator Voltage		volts	EGV0341A
345 KV Bus 2 Voltage		KV	EDV0330A

TABLE 6A
SIMULATOR CERTIFICATION TESTING CRITICAL PARAMETER LIST

Parameter Title		Units	Datapool Variable
4160 V Voltage	Bus 15	volts	EDV0347A
	Bus 16	volts	EDV0348A
4160 V Frequency	Bus 15	Hz	EDFBUS15
	Bus 16	Hz	EDFBUS16
480 V Safeguards	Bus 110 Voltage	volts	EDEB110
	Bus 120 Voltage	volts	EDEB120
Instrument AC Status	Pnl 111	Bool	ED:B0111
	Pnl 112	Bool	ED:B0112
	Pnl 113	Bool	ED:B0113
	Pnl 114	Bool	ED:B0114
	Pnl 117	Bool	ED:B0117
	Pnl 118	Bool	ED:B0118
125 VDC Voltage	Pnl 11	volts	EDEBAT11
	Pnl 12	volts	EDEBAT12
Containment Pressure		psig	CHP1005A
Containment Temperature		F	CHTCONT
Steam Generator Pressure	SGA	psia	RXPS468
	SGB	psia	RXPS478
Wide Range Steam Generator Level	SGA	%	RXL0409A
	SGB	%	RXL0429A
Narrow Range Steam Generator Level	SGA	%	RXL0405A
	SGB	%	RXL0425A
Safeguards Actuation Signal	Train A	Bool	RP:SISA
	Train B	Bool	RP:SISB
Pressurizer Relief Valve Status		Bool	RCY9201D
Safety Injection Flow	11 SI Pump	gpm	SIF0922A
	12 SI Pump	gpm	SIF0923A
RWST Level		%	SILRWSTP
Component Cooling Pump Pressure	11 Header	psig	CCPHDR11
	12 Header	psig	CCPHDR12
Cooling Water Header Pressure	Loop A	psig	CLP41504
	Loop B	psig	CLP41505
CVCS Charging Flow		gpm	VCF0128A
Boron Concentration		ppm	RCB
Subcooling Margin	Train A	F	RCTSUBCA
	Train B	F	RCTSUBCB

Note that variables are not listed for Steam Generator Temperature or Pressurizer Relief Valve Flow. These values are not available to the operator and are not easily available on the simulator. For Pressurizer Relief Valve Flow a status point is listed since this is available to the operator.

APPENDIX 7

MALFUNCTION TEST PROCEDURE SAMPLE

Following are two samples of malfunction test procedures. Two different formats are followed; the first format uses the parts of the updated Acceptance Test Procedure along with the Cause and Effects pages which describe the details of the malfunction being tested, the second format is a completely rewritten test procedure specifically for certification testing of malfunctions. During the next four years we intend to rewrite all test procedures to follow the second format and to replace the malfunction testing section of the Acceptance Test Procedure with these procedures.

PITC ANNUAL SIMULATOR OPERABILITY TEST PROCEDURE

MALFUNCTION TEST - REACTOR COOLANT SYSTEM

MALFUNCTION RC01

PROCEDURE APPROVAL: Revision 0

Prepared by: [signature] Approved by: [signature] 10/1/90
SIG/DATE

OVERVIEW:

The purpose of this test is to monitor the control board response resulting from the insertion of a Reactor Coolant Pump Trip malfunction. This test will compare expected response with simulator control board response. A satisfactory test will be confirmed if all responses are as expected and are within the bounds described in the malfunction cause and effects manual for a "REACTOR COOLANT PUMP TRIP - RC01".

EXPECTED RESULT:

The simulator will respond to this malfunction as described in the Cause and Effects and in the Acceptance Test Procedure (both attached).

PROCEDURE:

Test this malfunction as described in the Cause and Effects and in the Acceptance Test Procedure (both attached).

TEST DATE

MALF NO.	MALFUNCTION TITLE/RANGE/CAUSE & EFFECTS

RC01 REACTOR COOLANT PUMP TRIP
MALF - A - 11 RCP

MALF - B - 12 RCP

TYPE:GENERIC

CAUSE:FAULTY 86 RELAY ACTUATION

PLT STA:100% REACTOR POWER

EFFECTS:THE WHITE AND GREEN LAMPS WILL ENERGIZE AND THE RED LAMP WILL DEENERGIZE ON THE BREAKER INDICATION FOR THE SELECTED REACTOR COOLANT PUMP. FLOW THROUGH THE AFFECTED LOOP WILL DECREASE TO ZERO IN APPROXIMATELY 60 SECONDS. REVERSE FLOW THROUGH THE AFFECTED LOOP WILL OCCUR DUE TO THE DELTA P ACROSS THE CORE DEVELOPED BY THE OPERATING REACTOR COOLANT PUMP.

A REACTOR TRIP DUE TO REACTOR COOLANT PUMP BREAKER OPENING WILL OCCUR. PRESSURIZER PRESSURE AND LEVEL WILL INCREASE INITIALLY DUE TO THE DECREASED HEAT TRANSFER FROM THE REACTOR COOLANT SYSTEM. THE REACTOR COOLANT SYSTEM WILL REACH STEADY STATE HOT SHUTDOWN CONDITIONS WITH DECAY HEAT BEING REMOVED BY THE OPERABLE REACTOR COOLANT LOOP.

MALFUNCTION REMOVAL WILL RESET AND RESTORE THE LOCKOUT RELAY TO NORMAL OPERATION.

TEST			RESULTS			
STEP	PANEL	TAG NUMBER	SID	TAG NUMBER	PANEL	INIT D.R.
0000	FILENAME X49413					
	MALF	RC01	RC			
	RCP TRIP					
0001	PCM	IC09	YP			--------
	INITIALIZE TO IC09			PLANT AT 100% POWER		
				A -------- P --------		
0002	PCM	RC01A	RC	47012-0101 47012-0501 46255	C-1 C-1 C-1	--------
	INSERT MALF RC01A			11 RCP LOCKED OUT ALARM ACTUATES, 11 RC LOOP LOW FLOW OR BKR OPEN ALARM ACTUATES, AND WHITE LAMP ILLUMINATES		
				47017-0301 F0403D	B-1 PPC	
				ONE LOOP LOW FLOW OR RCP BKR OPEN RX TRIP ALARM ACTUATES; A RX TRIP - TURB TRIP OCCURS		
				41072 41121	C-1 C-1	
				11 RC LOOP AND RTD BYPASS LOOP FLOWS DECREASE TO ZERO IN APPROX 60 SECONDS (REVERSE		

TEST				RESULTS		
STEP	PANEL	TAG NUMBER	SID	TAG NUMBER	PANEL	INIT D.R.
				FLOW THRU LOOP OCCURS)		
				47012-0503	C-1	
				RC RTD LOOPS TEMP BYP LOW FLOW ALARM ACTUATES		
				42042	C-1	
				42059	C-1	
				11 RC LOOP COLD LEG TEMP EQUALIZED WITH HOT LEG TEMP (SMALL DELTA T); DECAY HEAT WILL BE REMOVED BY 12 RC LOOP/SG		
				A -------- B --------		
0003	C-1	46255	RC	47012-0101	C-1	--------
				46255	C-1	
		PLACE 11 RCP CONTROL SWITCH IN STOP		ALARM CLEARS, WHITE LAMP DEENERGIZES		
				A -------- B --------		

TEST			RESULTS			
STEP	PANEL	TAG NUMBER	SID	TAG NUMBER	PANEL	INIT D.R.
0004	C-1	46257	RC			--------
	C-1	46255	RC			

START 11 RCP OL PUMP THEN ATTEMPT TO START 11 RCP — 11 RCP BKR CLOSES THEN IMMEDIATELY LOCK OUT TRIPS

A --------
B --------

STEP	PANEL	TAG NUMBER	SID	TAG NUMBER	PANEL	INIT D.R.
0005	PCM	RC01A	RC			--------
	C-1	46255	RC			

REMOVE MALF RC01A, RESET AND START 11 RCP — 11 RCP STARTS

A --------
B --------

STEP	PANEL	TAG NUMBER	SID	TAG NUMBER	PANEL	INIT D.R.
0006	PCM	RC01B	RC			--------
	C-1	46256	RC			
	C-1	46258	RC			

PERFORM STEPS 4.13.1.1 THRU 4.13.1.5 FOR MALF RC01B — EXPECTED RESULTS SIMILAR FOR 12 RCP

TEST SUMMARY AND EVALUATION:

1. Evaluate data and complete a summary report for this test.

SIGNATURE/DATE

TEST APPROVAL:

1. The test results are approved and any recommended corrective actions have been entered into the Simulator Change process.

SIGNATURE/DATE

PITC ANNUAL SIMULATOR OPERABILITY TEST PROCEDURE

MALFUNCTION TEST - COMPONENT COOLING WATER SYSTEM

CC05

PROCEDURE APPROVAL: Revi. ion 0

Prepared by: [signature] Approved by: [signature] 5/18/90
SIG/DATE

OVERVIEW:

The purpose of this test is to monitor the control board response resulting from the insertion of a CCW System Piping Rupture malfunction. This test will compare expected response with simulator control board response. A satisfactory test will be confirmed if all responses are as expected and are within the bounds described in the malfunction cause and effects manual for a "CCW SYSTEM PIPING RUPTURE CC05".

EXPECTED RESULT:

1. The malfunction will cause the system to respond as if a piping failure occurred at vent CC-33-39. This malfunction has a variable severity, the effects will depend on the severity. At low severities the surge tank level will decrease and automatic makeup will refill and attempt to maintain a level in the tank. At higher severities the tank level will not be maintained, system flows and pressures will decrease, and temperatures will increase. A severity of 100% equals 4000 gpm at 100 psig.

2. The effects of a loss of component cooling to related equipment will be; increased temperatures and possible loss of flow to them, when proper response is taken.

3. The malfunction can be removed and the system will return to normal operation.

4. This procedure will review the effects of related remote functions CC100 and CC101 for proper operation.

TEST STEPS:

TEST DATE

1. ENTER SATAR TEST DATA REQUIRED FOR THIS TEST INTO THE SATAR PC. TEST NUMBER FOR THIS TEST IS 014 00 001.

INITIAL

2. SELECT IC-07 (6% POWER, BOC), RESET SIMULATOR TO IC-07 AND ALLOW THE SIMULATOR TO INITIALIZE. WHEN THE READY LIGHT COMES ON, THE SIMULATOR/PC SHOULD BE READY FOR THE NEXT TEST ENTERED INTO THE SATAR PC.

INITIAL

3. INSERT MALFUNCTION CC05, AT A SEVERITY OF 1% (ABOUT 40 GPM), ON A TIME DELAY OF ONE MINUTE. PLACE SIMULATOR IN RUN MODE AND CHECK PARAMETERS STABLE.

INITIAL

4. MONITOR THE FOLLOWING INDICATIONS FOR THE EXPECTED RESPONSE:

   CC SUMP HIGH LEVEL ALARM (47019:0603) ACTUATES.

   11 CC SURGE TANK LEVEL DECREASES AT APPROXIMATELY 1 IN/MIN ON INDICATOR 41007, AND ON ERCS 1L2703A.

   11 CC SURGE TANK LO LEVEL ALARM 47020:0602 ACTUATES WHEN LEVEL DECREASES TO -6 INCHES, CV-31432 WILL ALSO OPEN AT THIS LEVEL.

   LEVEL WILL INCREASE TO 0 INCHES AND CV-31432 WILL CLOSE.

INITIAL

5. (TESTING FOR REMOTE FUNCTION CC100.) PLACE CS-46037 FOR 12 CC PUMP IN PULLOUT. USE CS-46032 TO CLOSE MV-32121. MONITOR THE FOLLOWING INDICATIONS FOR THE EXPECTED RESPONSE:

   12 COMPONENT COOLING WATER PUMP DISCHARGE HEADER LOW PRESSURE ALARM 47019:0402 ACTUATES.

   12 CONTAINMENT SPRAY PUMP CC WATER LOW FLOW ALARM 47019:0402 ACTUATES.

   12 SI PUMP CC WATER LOW FLOW ALARM 47018:0402 ACTUATES.

   12 RHR PUMP CC WATER LOW FLOW ALARM 47016:0403 ACTUATES.

INITIAL

6. USE REMOTE CC100 TO CLOSE MV-32266, CC TO RCP'S. FLOW INDICATION 4127601 AND 4127701 WILL GO TO ZERO, COMPONENT COOLING WATER RCP LOOP 11 ISOLATION VALVE SHUT ALARM 47020:0403. RE-OPEN MV-32266 WITH REMOTE CC100.

INITIAL

7. OPEN UNIT 1 TO UNIT 2 CC CROSSCONNECT VALVES USING REMOTE CC102. THE LEVEL DECREASE SHOULD SLOW TO APPROXIMATELY 0.5 INCHES PER MINUTE, AS INDICATED ON 41007, 41506 AND 1L2703A. THE 11 AND 21 SURGE TANK LEVEL ALARMS WILL ACTUATE AT -6 INCHES AND CLEAR ABOVE -6 INCHES (47020:0602 AND 47520:0606).

INITIAL

8. CLOSE THE UNIT 1 TO UNIT 2 CC CROSSCONNECTS USING REMOTE CC102. THEN INCREASE SEVERITY TO 2%.

INITIAL

9. LEVEL IN 11 CC SURGE TANK (41007 AND 1L2703A)) WILL DECREASE FASTER DOWN TO -6 INCHES, AND WILL CONTINUE DOWN. MAKEUP FLOW IS LESS THAN RUPTURE FLOW.

INITIAL

10. 11 CC HEAT EXCHANGER OUTLET FLOW INCREASES (41008-03).

INITIAL

11. INCREASE CC05 MALFUNCTION SEVERITY TO 100%.

INITIAL

12. MONITOR THE FOLLOWING INDICATIONS FOR THE EXPECTED RESPONSE:

    11 CC SURGE TANK LEVEL DECREASES RAPIDLY CAUSING LO LO LEVEL ALARM (47020-0103) TO ACTUATE.

    11 CC HEAT EXCHANGER OUTLET FLOW INCREASES (41008-03).

    CC HEADER PRESSURE DECREASES (41008-01 AND 1P2608A), RESULTING IN AN AUTOMATIC START OF 12 CC PUMP (46037). 12 CC HEAT EXCHANGER FLOW (41009-03) AND PRESSURE (41009-01 AND 1P02609A) INCREASE ONLY SLIGHTLY.

    11 AND 12 CC PUMPS WILL APPEAR TO BE CAVITATING, AS INDICATED BY THEIR OSCILLATING FLOWS AND PRESSURES. AFTER FIVE MINUTES THEY WILL TRIP ON OVERLOAD (46036,46037 AND 47020:0101,47020:0102).

    RCP BEARING AND STATOR TEMPERATURES INCREASE AS INDICATED ON RECORDERS 42003 AND 42023.

    CVCS LETDOWN TEMPERATURE INCREASES (41053-02), AND TCV130 OPENS FULLY (43025-02). THE LETDOWN FLOW (41050) AND PRESSURE(41056) WILL BEGIN TO CYCLE AS THE LETDOWN LIQUID FLASHES TO STEAM.

    LETDOWN FLOW HIGH TEMPERATURE ALARM (47015:0408) ACTUATES.

    WASTE DISPOSAL BORON RECYCLE PANEL TROUBLE ALARM (47015:0101) ACTUATES.

    AUXILIARY BUILDING SUMP HI LEVEL ALARM (47019:0503) ACTUATES.

INITIAL

13. FREEZE THE SIMULATOR, AND THEN RESET TO IC-07 AND ALLOW THE SIMULATOR TO INITIALIZE.

INITIAL .

14. INSERT MALFUNCTION CC05 AT 10% SEVERITY ON A ONE MINUTE TIME DELAY. PLACE THE SIMULATOR IN THE RUN MODE AND OBSERVE THE CC SYSTEM OPERATION. WHEN THE CC SURGE TANK LEVEL IS BELOW -10 INCHES, REMOVE THE MALFUNCTION CC05. THE SYSTEM WILL RETURN TO NORMAL OPERATION.

INITIAL

15. (TESTING FOR REMOTE CC101.) START 12 CC PUMP USING CS-46037, STOP 11 CC PUMP WITH CS-46036, AND PLACE IN PULLOUT. CLOSE MV-32120 WITH CS-46029. MONITOR THE FOLLOWING INDICATIONS FOR THE EXPECTED RESPONSE:

11 COMPONENT COOLING WATER PUMP DISCHARGE LOW PRESSURE ALARM 47020:0402 ACTUATES.

11 CONTAINMENT SPRAY PUMP CC WATER LOW FLOW ALARM 47019:0401 ACTUATES.

11 SI PUMP CC WATER LOW FLOW ALARM 47018:0401 ACTUATES.

11 RHR PUMP CC WATER LOW FLOW ALARM 47016:0402 ACTUATES.

INITIAL

16. USE REMOTE CC101 TO CLOSE MV-32266, CC FLOW TO RCP'S, FLOW INDICATION 4127601 AND 4127701 WILL GO TO ZERO, AND COMPONENT COOLING WATER RCP LOOP 12 ISOLATION VALVE SHUT ALARM 47020:0404 ACTUATES. RE-OPEN MV-32266 WITH REMOTE CC101, INDICATED FLOW WILL RETURN TO NORMAL.

INITIAL

TEST SUMMARY AND EVALUATION:

1. Evaluate data and complete a summary report for this test.

SIGNATURE/DATE

TEST APPROVAL:

1. The test results are approved and any recommended corrective actions have been entered into the Simulator Change process.

SIGNATURE/DATE

Test Point Files

Disk File	Symbol	(Array)	Description
01400000	CCPHDR11	(000,000,000)	HEADER 11 PRESSURE
01400000	CCPHDR12	(000,000,000)	HEADER 12 PRESSURE
01400000	CC:P1A13	(000,000,000)	11 CCP BREAKER STATUS
01400000	CC:P1A14	(000,000,000)	11 CCP L.O.TRIP
01400000	CC:P2A13	(000,000,000)	12 CCP BREAKER STATUS
01400000	CC:P2A14	(000,000,000)	12 CCP L.O.TRIP
01400000	CC:SV035	(000,000,000)	CV31432 COMMAND STATUS
01400000	CCF0614A	(000,000,000)	11 SL WTR HX CC OUT F
01400000	CCF0615A	(000,000,000)	11 LTDN HX CC OUT FLOW
01400000	CCF0617A	(000,000,000)	11 RCP CC OUTLET FLOW
01400000	CCF0618A	(000,000,000)	12 RCP CC OUTLET FLOW
01400000	CCFMF05	(000,000,000)	LEAK FLOW DUE TO M LF05
01400000	CCFMU	(000,000,000)	MK-UP FROM RX MU
01400000	CCL2703A	(000,000,000)	11 CC SURGE TANK LEVEL
01401000	CCL2703A	(000,000,000)	11 CC SURGE TANK LEVEL
01401000	CC:SV035	(000,000,000)	CV31432 COMMAND STATUS
01401000	CCFMU	(000,000,000)	MK-UP FROM RX MU

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990
APPENDIX 8

MALFUNCTION TESTING ABSTRACT

The following list of malfunction tests were completed between January 1, 1989 and February 1, 1991. For all tests with discrete options (type D) all options were tested. For those tests with variable severity capabilities (type V, VS - Variable Setpoints or SO - System Overrides) three severities were tested for each discrete option (with a few exceptions where three severities were not reasonable). Generally, the three severities chosen included the minimum and maximum of the available range.

The initial conditions for each of these tests were chosen from the available protected IC sets to enable the most appropriate testing. Some tests involved several initial conditions in order to test the range of simulator response.

All listed tests were reviewed by the Certification Review Panel listed in Appendix 4. All tests passed with the exception of the following:

TEST NO.	TITLE	DR#
EG11	EMERGENCY DIESEL GENERATOR LOAD LIMIT FAILURE	90D-184
PC03	ERCS ALARM DISPLAY FAILURE	90I-082
PC04	ERCS SAS DISPLAY FAILURE	90I-082
PC05	ERCS CONTROL ROOM PRINTER FAILURE	90I-082
ED15	DEGRADED GRID VOLTAGE	90D-181
SG03	STEAM GENERATOR BLOWDOWN CONTROL VLV FAILS	90D-200
TC11	COMPLETE TURBINE TRIP FAILURE	90D-192
CL06	SFGRDS COOLING WATER SUPPLY PIPING RUPTURE	90D-095
ED10	LOSS OF 480 V BUS	91D-016
RC11	LOSS OF COOLANT ACCIDENT - RTD BYPASS LOOP	91D-028
RX208	AUCTIONEERED TAVG OVERRIDE	91D-035
TC04	TURBINE CONTROL VALVE FAILS OPEN	90D-227
VC201	VC TEMPERATURE TRANSMITTER	91D-015
RX300	PRESSURIZER PORV SETPOINTS	91I-001
FW03	LOSS OF CONDENSER VACUUM	90D-238

The following simulator certification tests have not been completed due to waiting for additional information on expected plant response:

TEST NO.	TITLE
MS07	MOISTURE SEPARATOR - REHEATER TUBE LEAK
MS10	MAIN STEAM LINE BREAK ON COMMON AFW SUPPLY LINE
TU01	LOSS OF TURBINE LUBE OIL SUPPLY
CC04	CC SUPPLY VALVE TO RCP FAILS CLOSED
VC05	STUCK OPEN CHARGING PUMP RELIEF VALVE
RD07	DROPPED ROD
EG05	GENERATOR VOLTAGE REGULATOR FAILURE
RC02	REACTOR COOLANT PUMP LOCKED ROTOR

MALFUNCTION TESTING ABSTRACTS

The following simulator malfunctions were decided by the Simulator Design Review Committee to be excluded from the certified malfunctions since these malfunctions were designed for Emergency Plan drill use and are not realistic. Note that other fuel failure malfunctions which give realistic plant response are available:

CR02 Gross Fuel Failure
CR04 Fuel Cladding Failure

All tests which failed will be corrected and retested by 12/91. All tests waiting for additional plant response information will be completed by 12/91.

MALFUNCTION TESTING

Test Number	Title	Type	Approved Date	Comments
Variable Setpoints				
EG200	EG TEMP XTMR	SO	08/20/90	
FW200	COND FLW XTMR	SO	07/24/90	
FW201	CDSR HW XTMR	SO	07/24/90	
FW202	11A FW LEVEL XTMR	SO	07/24/90	
FW203	12A FW LEVEL XTMR	SO	07/24/90	
FW204	11B FW LEVEL XTMR	SO	07/24/90	
FW205	12B FW LEVEL XTMR	SO	07/24/90	
FW206	13A FW LEVEL XTMR	SO	07/24/90	
FW207	13B FW LEVEL XTMR	SO	07/24/90	
FW208	15A FW LEVEL XTMR	SO	07/24/90	
FW209	15B FW LEVEL XTMR	SO	07/24/90	
MS200	1B MS LEVEL XTMR	SO	08/20/90	
MS201	2B MS LEVEL XTMR	SO	08/20/90	
MS202	1A MS LEVEL XTMR	SO	07/24/90	
MS203	2A MS LEVEL XTMR	SO	07/24/90	
MS204	1B RHDT LEVEL XTMR	SO	08/20/90	
MS205	2B RHDT LEVEL XTMR	SO	08/20/90	
MS206	1A RHDT LEVEL XTMR	SO	08/20/90	
MS207	2A RHDT LEVEL XTMR	SO	08/20/90	
MS208	1B RHDT LEVEL XTMR	SO	08/20/90	
MS209	2B RHDT LEVEL XTMR	SO	08/20/90	
MS210	1A RHDT LEVEL XTMR	SO	08/20/90	
MS211	2A RHDT LEVEL XTMR	SO	08/20/90	
RH200	RH FLOW XTMR	SO	07/24/90	

Test Number	Title	Type	Approved Date	Comments
RX200	RCS PRESSURE XTMR	SO	01/08/91	
RX201	RCS PRESSURE XTMR	SO	01/08/91	
RX202	RCS PRESSURE XTMR	SO	01/08/91	
RX203	RCS PRESSURE XTMR	SO	01/08/91	
RX204	PRZR LVL XTMR	SO	01/25/91	
RX205	PRZR LVL XTMR	SO	01/25/91	
RX206	SG LEVEL XTMR	SO	01/08/91	
RX207	SG LEVEL XTMR	SO	01/08/91	
RX208	AUCTIONEERED T_{AVG}	SO	01/21/91	FAILED
RX209	FW FLOW XTMR	SO	01/08/91	
RX210	FW FLOW XTMR	SO	01/08/91	
RX211	FW FLOW XTMR	SO	01/08/91	
RX212	FW FLOW XTMR	SO	01/08/91	
RX213	11/12 MS PRESSURE XTMR	SO	01/08/91	
RX214	11 MS PRESSURE XTMR	SO	01/08/91	
RX215	11 MS PRESSURE XTMR	SO	01/08/91	
RX216	12 MS PRESSURE XTMR	SO	01/08/91	
RX217	12 MS PRESSURE XTMR	SO	01/08/91	
RX219	11 MS FLOW XTMR	SO	01/08/91	
RX220	11 MS FLOW XTMR	SO	01/08/91	
RX221	12 MS FLOW XTMR	SO	01/08/91	
RX222	12 MS FLOW XTMR	SO	01/08/91	
RX223	11 STM FLOW XTMR	SO	01/08/91	
RX224	12 STM FLOW XTMR	SO	01/08/91	
RX225	11 FEED FLOW XTMR	SO	01/08/91	
RX226	12 FEED FLOW XTMR	SO	01/08/91	
RX227	11 FEED TEMP XTTR	SO	01/08/91	
RX228	12 FEED TEMP XTTR	SO	01/08/91	
RX229	FW HDR PRESSURE XTMR	SO	01/08/91	
RX230	FW HDR PRESSURE XTMR	SO	01/08/91	
RX231	11 SG WR LEVEL XTMR	SO	01/25/91	
RX232	12 SG WR LEVEL XTMR	SO	01/25/91	
VC200	VC PRESSURE XTMR	SO	01/08/91	
VC201	VC TEMPERATURE XTMR	SO	01/28/91	FAILED
VC202	VC FLOW XTMR	SO	01/25/91	
VC203	VC FLOW XTMR	SO	01/25/91	

Variable Setpoints

CH300	CNMT HI/HI HI PRESS	VS	07/24/90	
MS300	SG SAFETY VALVES	VS	01/21/91	

Test Number	Title	Type	Approved Date	Comments
NI300	IR PWR ABOVE P-6	VS	01/25/91	
NI302	PR PWR ABOVE P-8	VS	09/25/90	
NI306	PR PWR ABOVE P-9	VS	09/25/9C	
NI310	PR PWR ABOVE P-10	VS	09/25/90	
NI316	IR HI FLUX TRIP	VS	09/25/90	
NI318	PR LO RNG HI FLUX TRIP	VS	09/25/90	
NI322	PR HI RNG HI FLUX TRIP/POS RATE TRIP/ NEG RATE TRIP	VS	01/28/91	
RC300	PRZR SAFETY	VS	01/25/91	
RP300	P-7 TURB PRESS	VS	01/25/91	
RP302	AUTO ROD WITHDRAWAL BLOCK P-2	VS	08/20/90	
RP303	BUS 11/12 UV TRIP	VS	08/20/90	
RP305	BUS 11/12 UF TRIP	VS	08/20/90	
RP313	PRZR LO PRESS TRIP/SI	VS	01/25/91	
RP323	PRZR HI LVL TRIP	VS	09/25/90	
RP326	SG LOLO LVL TRIP	VS	09/25/90	
RP340	LOLO T_{AVG} STM LN ISOL/HI SYM FLOW	VS	09/25/90	
RP348	SG HI-HI STM FLOW	VS	09/25/90	
RP352	SG LOLO STM PRESS SI	VS	09/25/90	
RX300	PRZR HI PRESS PCV	VS	01/15/91	FAILED
RX302	STM DUMP HI/HI HI T_{AVG}	VS	01/25/91	
RX305	MASTER PRZR PRESS CONT SETPOINT	VS	01/25/91	
TC300	INIT TURB CV POS	VS	01/03/91	

Malfunctions

Component Cooling System

CC01	COMPONENT COOLING WATER PUMP TRIP	D	03/02/90	
CC02	COMPONENT COOLING PUMP FAILS TO START AUTOMATICALLY	D	03/12/90	
CC04	COMPONENT COOLING WATER SUPPLY VALVE TO RCP FAILS CLOSED	D		HOLD
CC05	COMPONENT COOLING WATER SYSTEM PIPING RUPTURE	V	06/06/90	
CC06	CCW VALVE [illegible]URE TO OPEN RHR HEAT EXCHANG[illegible]JTO ON PUMP START	D	03/03/90	
CC08	COMPONENT COOLING SURGE TANK AUTO MAKEUP FAILURE	D	05/09/90	
CC09	SEAL WATER HEAT EXCHANGER LEAK	V	05/09/90	

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990
APPENDIX 8

Test Number	Title	Type	Approved Date	Comments
Containment/HVAC System				
CH01	CONTAINMENT PRESSURE TRANSMITTER FAILURE	V	03/02/90	
Cooling Water System				
CL01	COOLING WATER PUMP	D	03/02/90	
CL02	DIESEL COOLING WATER PUMP FAILS TO START AUTOMATICALLY	D	0[illegible]/0[illegible]/90	
CL03	121 COOLING WATER PUMP FAILS TO START AUTOMATICALLY	D	03/02/90	
CL04	DIESEL COOLING WATER PUMP TRIP	D	03/02/90	
CL06	SAFEGUARDS COOLING WATER SUPPLY PIPING RUPTURE	V	06/06/90	FAILED
CL07	COOLING WATER SYSTEM TURBINE BUILDING PIPE RUPTURE	V	06/06/90	
CL08	COOLING WATER LEAK INSIDE CONTAINMENT	V	06/06/90	
Reactor Core System				
CR01	FUEL CLADDING FAILURE	V		
CR03	REACTOR COOLANT SYSTEM CRUD BURST	V		
Containment Spray System				
CS01	CONTAINMENT SPRAY PUMP TRIP	D	03/02/90	
CS02	CAUSTIC ADDITION VALVE FAILURE TO OPEN IN AUTOMATIC	D	03/02/90	
CS03	CONTAINMENT SPRAY PUMP FAILS TO START AUTOMATICALLY	D	03/02/90	
Circulating Water System				
CW01	CONDENSER TUBE LEAK	V		TO BE DELETED
CW02	CIRCULATING WATER PUMP TRIP	D	01/31/91	
CW03	CIRCULATING WATER PUMP BEARING FAILURE	D	05/09/90	
CW04	CONDENSER TUBES PLUGGED	V	06/06/90	
CW05	CONDENSER TUBE RUPTURE	V	06/06/90	
CW06	TRAVELING SCREEN BLOCKAGE ON APPROACH CANAL	V	06/06/90	
CW07	CONDENSER PIT FLOOD	V	06/06/90	

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990
APPENDIX 8

Test Number	Title	Type	Approved Date	Comments
Electrical Distribution System				
ED01	LOSS OF OFFSITE POWER	D	09/25/90	
ED03	LOSS OF OFFSITE POWER	D	09/25/90	
ED04	FAULT IN UNIT 1 M TRANSFORMER-AUTO TRANSFER	D	09/25/90	
ED05	FAULT IN UNIT 1 M TRANSFORMER-WITH DELAYED TRANSFER	D	09/25/90	
ED06	FAULT IN UNIT SUBSTATION TRANSFORMER	D	10/16/90	
ED07	LOSS OF 125 VDC BUS	D	01/21/91	
ED08	LOSS OF 120 VAC INSTRUMENT BUS	D	01/28/91	
ED09	LOSS OF 4160V BUS	D	09/25/90	
ED10	LOSS OF 480 VAC BUS	D	01/21/91	FAILED
ED11	BUS 15 LOAD REJECTION-RESTORATION SEQUENCE TIMER FAILURE	V	10/16/90	
ED12	BUS 16 LOAD REJECTION-RESTORATION SEQUENCE TIMER FAILURE	V	10/16/90	
ED13	VOLTAGE RESTORING SCHEME SEQUENCER FAILURE	D	10/16/90	
ED14	LOSS OF ALL AC	D	10/16/90	
ED15	DEGRADED GRID VOLTAGE	V	10/16/90	FAILED
ED16	DEGRADED GRID FREQUENCY	V	10/16/90	
Electrical Generation System				
EG01	GENERATOR OUTPUT BREAKER FAILS TO OPEN FOLLOWING TURBINE TRIP	D	06/06/90	
EG02	LOSS GENERATOR HYDROGEN COOLING	D	07/24/90	
EG03	LOSS OF OFFSITE POWER	D	08/20/90	
EG05	GENERATOR VOLTAGE REGULATOR FAILURE	V		HOLD
EG06	GENERATOR FAULT	D	06/06/90	
EG07	GENERATOR LOSS OF EXCITATION	D	06/06/90	
EG08	LOSS OF EMERGENCY DIESEL GENERATOR	D	06/06/90	
EG09	EMERGENCY DIESEL GENERATOR FAILS TO START	D	07/24/90	
EG10	EMERGENCY DIESEL GENERATOR OUTPUT BREAKER FAILS OPEN	D	08/20/90	
EG11	EMERGENCY DIESEL GENERATOR LOAD LIMIT FAILURE	V	09/25/90	FAILED

Test Number	Title	Type	Approved Date	Comments
Condensate and Feedwater System				
FW01	CONDENSATE PUMP TRIP	D	03/02/90	
FW02	13 CONDENSATE PUMP FAILS TO START AUTOMATICALLY	D	03/02/90	
FW03	LOSS OF CONDENSER VACUUM	V	06/06/90	FAILED
FW05	CONDENSATE PUMP RECIRC VALVE FAILS OPEN	D	08/20/90	
FW06	CONDENSATE PUMP RECIRC VALVE FAILS CLOSED	D	08/20/90	
FW07	CONDENSATE HOTWELL MAKEUP VALVE FAILS OPEN	D	03/02/90	
FW08	CONDENSER HOTWELL MAKEUP VALVE FAILS CLOSED	D	06/06/90	
FW09	LP FEEDWATER HEATER BYPASS VALVE FAILS OPEN	D	06/06/90	
FW10	CONDENSER HOTWELL LEVEL TRANSMITTER FAILS HIGH	D	10/16/90	
FW11	CONDENSER HOTWELL TRANSMITTER FAILS LOW	D	01/21/91	
FW1[illegible]	MAIN FEEDWATER PUMP TRIP	D	06/06/90	
FW15	FEEDWATER HP HEATER HIGH LEVEL	D	04/12/90	
FW16	FEEDWATER LP HEATER HIGH LEVEL	D	04/12/90	
FW17	FEEDWATER HP HEATER LEAK	V	07/24/90	
FW18	FEEDWATER LP HEATER LEAK	V	01/15/91	
FW19	FEEDWATER SYSTEM RUPTURE INSIDE CONTAINMENT	V	01/08/91	
FW20	FEEDWATER SYSTEM LEAKAGE INSIDE CONTAINMENT	V	09/25/90	
FW21	FEEDWATER SYSTEM RUPTURE INSIDE CONTAINMENT UPSTREAM OF CHECK VALVE	V	01/08/91	
FW22	FEEDWATER SYSTEM RUPTURE OUTSIDE CONTAINMENT	V	01/15/91	
FW23	FEEDWATER SYSTEM LEAKAGE OUTSIDE CONTAINMENT	V	09/25/90	
FW24	FEEDWATER PUMP COMMON DISCHARGE HEADER RUPTURE	V	01/21/91	
FW25	FEEDWATER FLOW CONTROL VALVE FAILS TO CLOSE ON FW ISOLATION SIGNAL	D	07/24/90	
FW26	FEEDWATER FLOW CONTROL VALVE FAILS OPEN	V	01/31/91	
FW27	FEEDWATER FLOW CONTROL VALVE FAILS CLOSED	D	09/25/90	
FW28	HEATER DRAIN PUMP TRIP	D	03/02/90	
FW29	HEATER DRAIN TANK LEVEL TRANSMITTER FAILS HIGH	D	09/25/90	

Test Number	Title	Type	Approved Date	Comments
FW30	HEATER DRAIN TANK LEVEL TRANSMITTER FAILS LOW	D	09/25/90	
FW31	HEATER DRAIN PUMP FAILS TO MINIMUM	D	09/25/90	
FW32	AUXILIARY FEEDWATER PUMP TRIP, MOTOR	D	03/02/90	
FW33	AUXILIARY FEEDWATER PUMP TRIP, TURBINE	D	03/02/90	
FW34	AUXILIARY FEEDWATER PUMP FAILS TO START AUTOMATICALLY	D	03/02/90	
FW35	INADEQUATE CONDENSATE TO AUXILIARY FEEDWATER PUMP SUCTION	V	01/15/90	
FW36	AUXILIARY FEEDWATER DISCHARGE LINE RUPTURE INSIDE CONTAINMENT	V	01/21/91	
FW37	AUXILIARY FEEDWATER DISCHARGE LINE RUPTURE OUTSIDE CONTAINMENT	V	01/08/91	
FW38	AUXILIARY FEEDWATER CONTROL VALVE FAIL IN POSITION	D	03/02/90	
FW39	FEEDWATER LINE RUPTURE UPSTREAM OF FW REG VALVES	V	09/25/90	
FW40	COMMON FEEDWATER PUMP SUCTION LINE BLOCKAGE	V	01/28/91	
FW41	FEEDWATER FLOW CONTROL VALVE LEAKAGE	V	01/15/91	
Compressed Air System				
IA01	LOSS OF SERVICE AIR HEADER	V	10/16/90	
IA02	LOSS OF INSTRUMENT AIR HEADER	V	01/28/91	
IA03	LOSS OF AIR COMPRESSOR	D	03/02/90	
Main Steam System				
MS01	MAIN STEAM LINE RUPTURE INSIDE CONTAINMENT UPSTREAM OF MSIV	V	01/21/91	
MS02	MAIN STEAM LINE RUPTURE OUTSIDE CONTAINMENT UPSTREAM OF MSIV	V	01/15/91	
MS03	MAIN STEAM LINE RUPTURE OUTSIDE CONTAINMENT DOWNSTREAM OF MSIV	V	09/25/90	
MS04	MAIN STEAM LINE LEAK	V	09/25/90	
MS05	MAIN STEAM SAFETY VALVE STICKS OPEN	D	05/09/90	
MS06	GLAND SEAL STEAM REGULATING VALVE FAILS CLOSED	D	09/25/90	
MS07	MOISTURE SEPARATOR - REHEATER TUBE LEAK	V		HOLD
MS08	MOISTURE SEPARATOR - REHEATER RELIEF VALVES FAILURE	D	01/08/91	

Test Number	Title	Type	Approved Date	Comments
MS09	MAIN STEAM LINE LEAK INSIDE CONTAINMENT	V	01/21/91	
MS10	MAIN STEAM LINE BREAK ON COMMON SUPPLY LINE TO AFW	V		HOLD
MS11	STEAM DUMP VALVE FAILS IN POSITION	D	01/31/91	
Nuclear Instrumentation System				
NI01	INCORRECT SOURCE RANGE CHANNEL RESPONSE	V	05/09/90	
NI02	SOURCE RANGE CHANNEL SPIKES	D	05/09/90	
NI03	INTERMEDIATE RANGE CHANNEL IMPROPER RESPONSE	V	05/09/90	
NI04	INTERMEDIATE RANGE CHANNEL IMPROPER COMPENSATION	V	01/21/91	
NI05	IMPROPER POWER CHANNEL RESPONSE	V	10/16/90	
NI06	POWER RANGE UPPER CHANNEL IMPROPER RESPONSE	V	01/21/91	
NI07	POWER RANGE LOWER CHANNEL IMPROPER RRESPONSE	V	01/21/91	
Plant Process Computer System				
PC01	ERCS CPU FAILURE	D	09/25/90	
PC02	ERCS DATA CONCENTRATOR LINK TO CPU FAILURE	D	09/25/90	FAILED/TO BE DELETED
PC03	ERCS ALRM DISPLAY FAILURE	D	09/25/90	FAILED
PC04	ERCS SAS DISPLAY FAILURE	D	09/25/90	FAILED
PC05	ERCS CONTROL ROOM PRINTER FAILURE	D	09/25/90	FAILED
PC06	ERCS DISK A FAILURE	D	04/12/90	TO BE DELETED
Reactor Coolant System				
RC01	REACTOR COOLANT PUMP TRIP	D	10/16/90	
RC02	REACTOR COOLANT PUMP LOCKED ROTOR	D		HOLD
RC03	REACTOR COOLANT PUMP SHAFT SHEAR	D	08/20/90	
RC04	REACTOR COOLANT PUMP SHAFT SHEAR	D	10/16/90	
RC05	REACTOR COOLANT PUMP BEARING FAILURE	V	10/25/90	
RC06	LOSS OF COOLANT ACCIDENT - HOT LEG	V	01/28/91	
RC07	LOSS OF COOLANT ACCIDENT - COLD LEG RCP SUCTION	V	01/15/91	
RC08	LOSS OF COOLANT ACCIDENT - COLD LEG RCP DISCHARGE	V	01/28/91	

Test Number	Title	Type	Approved Date	Comments
RC09	LOSS OF COOLANT ACCIDENT, PRESSURIZER STEAM SPACE	V	01/25/91	
RC10	LOSS OF COOLANT ACCIDENT PRESSURIZER WATER SPACE	V	01/21/91	
RC11	LOSS OF COOLANT ACCIDENT-RTD BYPASS LOOP COLD LEG MANIFOLD	V	01/21/91	FAILED
RC12	LOSS OF COOLANT ACCIDENT-RTD BYPASS LOOP RETURN LEG PIPING	V	01/15/91	
RC13	LOSS OF COOLANT ACCIDENT - REACTOR HEAD VENT	V	01/31/91	
RC14	REACTOR COOLANT SYSTEM LEAKS	V	01/21/91	
RC15	REACTOR COOLANT SYSTEM LEAKS	V	01/15/91	
RC16	PRESSURIZER POWER OPERATED RELIEF VALVE FAILS CLOSED	D	01/21/91	
RC17	PRESSURIZER HIGH GAS CONCENTRATION IN VAPOR SPACE	V	01/15/91	
RC18	PRESSURIZER SAFETY VALVE RC-10-1 FAILS OPEN	D	12/05/90	
RC19	PRESSURIZER SAFETY VALVE SEAT LEAKS	V	12/05/90	
RC20	REACTOR COOLANT PUMP OIL LEAK, UPPER RESERVOIR	D	01/21/91	
RC21	REACTOR VESSEL O-RING LEAKAGE	D	01/28/91	
RC22	PRESSURIZER POWER OPERATED RELIEF VALVE LEAKAGE	V	10/25/90	
RC23	STEAM GENERATOR TUBES PLUGGED	V	12/05/90	
RC24	PRESSURIZER SPRAY VALVE FAILS IN POSITION	D	10/25/90	

Control Rod Drive System

Test Number	Title	Type	Approved Date	Comments
RD01	CONTROLLING ROD BANK FAILS TO MOVE IN MANUAL	D	03/02/90	
RD02	CONTROLLING ROD BANK FAILS TO MOVE IN AUTO	D	03/02/90	
RD03	UNCONTROLLED CONTINUOUS ROD WITH-DRAWAL OF CONTROLLING BANK	D	03/02/90	
RD04	UNCONTROLLED CONTINUOUS ROD INSERTION OF CONTROLLING BANK	D	03/03/90	
RD05	CONTROL ROD MISALIGNMENT	D	01/21/91	
RD06	STUCK ROD	D	03/02/90	
RD07	DROPPED ROD	D		HOLD
RD08	CONTROL ROD G-3 EJECTED	D	01/21/91	
RD09	ROD POSITION INDICATION FAILS	D	03/02/90	
RD10	INCORRECT ROD SPEED	D	03/02/90	

Test Number	Title	Type	Approved Date	Comments
Residual Heat Removal System				
RH01	RESIDUAL HEAT REMOVAL PUMP TRIP	D	03/02/90	
RH02	RESIDUAL HEAT REMOVAL PUMP FAILS TO START AUTOMATICALLY	D	03/02/90	
RH03	RHR HEAT EXCHANGER END BELL LEAKAGE TO ATMOSPHERE	V	08/20/90	
RH04	RHR HEAT EXCHANGER BYPASS VALVE FAILS OPEN	D	08/20/90	
RH05	RHR HEAT EXCHANGER BYPASS VALVE FAILS CLOSED	D	08/20/90	
RH06	RECIRCULATION SUMP SUCTION LINES BLOCKED	V	08/20/90	
RH07	RHR SYSTEM LEAKAGE	V	10/16/90	
RH08	RHR PUMP SEAL FAILURE	D	08/20/90	
RH09	RESIDUAL HEAT REMOVAL RELIEF VALVE FAILURE	D	08/20/90	
Reactor Protection System				
RP01	REACTOR TRIP	D	01/08/91	
RP02	FAILURE OF AUTOMATIC REACTOR TRIPS	D	08/20/90	
RP03	FAILURE OF SAFETY SYSTEMS TO ACTUATE	D	01/25/91	
RP04	INADVERTENT ACTUATION OF THE SAFETY INJECTION SYSTEM	D	01/08/91	
RP05	FAILURE OF CONTAINMENT ISOLATION PHASE A TO ACTUATE	D	01/25/91	
RP06	FAILURE OF MSIV'S TO ISOLATE	D	01/08/91	
RP07	MECHANICAL FAILURE OF REACTOR TRIP BREAKERS	D	01/08/91	
RP08	FAILURE OF SAFEGUARDS ACTUATION	D	01/25/90	
Reactor Control System				
RX01	PRESSURIZER SPRAY VALVE FAILS OPEN	V	03/02/90	
RX02	PRESSURIZER SPRAY VALVES PCV-431 A & B FAIL CLOSED	D	03/02/90	
RX03	PRESSURIZER HEATERS FAIL ON	D	03/02/90	
RX04	PRESSURIZER HEATERS FAIL OFF (ALL)	D	03/02/90	
RX05	REACTOR COOLANT LOOP T_H TRANSMITTER FAILS HIGH	D	03/02/90	
RX06	REACTOR COOLANT LOOP T_H TRANSMITTER FAILS LOW	D	03/02/90	

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990
APPENDIX 8

Test Number	Title	Type	Approved Date	Comments
RX07	REACTOR COOLANT T_C TRANSMITTER FAILS HIGH	D	03/02/90	
RX08	REACTOR COOLANT LOOP T_C TRANSMITTER FAILS LOW	D	03/02/90	
RX09	PRESSURIZER LEVEL NARROW RANGE TRANSMITTER FAILS HIGH	D	04/12/90	
RX10	PRESSURIZER LEVEL NARROW RANGE TRANSMITTER FAILS LOW	D	04/12/90	
RX11	PRESSURIZER PRESSURE TRANSMITTER FAILS HIGH	D	01/21/91	
RX12	PRESSURIZER PRESSURE TRANSMITTER FAILS LOW	D	01/21/91	
RX13	REACTOR COOLANT SYSTEM WIDE RANGE PRESSURE TRANSMITTER FAILS HIGH	D	04/12/90	
RX14	REACTOR COOLANT SYSTEM WIDE RANGE PRESSURE TRANSMITTER FAILS LOW	D	04/12/90	
RX15	STEAM GENERATOR LEVEL TRANS-MITTER FAILS HIGH	D	03/02/90	
RX16	STEAM GENERATOR LEVEL TRANS-MITTER FAILS LOW	D	03/02/90	
RX17	STEAM GENERATOR PRESSURE TRANS-MITTER FAILS HIGH	D	03/02/90	
RX18	STEAM GENERATOR PRESSURE TRANS-MITTER FAILS LOW	D	03/02/90	
RX19	MAIN STEAM LINE STEAM FLOW TRANS-MITTER FAILS HIGH	D	03/02/90	
RX20	MAIN STEAM LINE STEAM FLOW TRANS-MITTER FAILS LOW	D	03/02/90	
RX21	MAIN STEAM HEADER PRESSURE TRANS-MITTER FAILURE	V	04/12/90	
RX22	FEEDWATER CONTROLLER OUTPUT FAILURE	V	04/12/90	
RX23	FEEDWATER LINE FLOW TRANSMITTER FAILS HIGH	D	03/02/90	
RX24	FEEDWATER LINE FLOW TRANSMITTER FAILS LOW	D	03/02/90	
RX25	TURBINE FIRST STAGE PRESSURE TRANS MITTER FAILS HIGH	D	03/02/90	
RX26	TURBINE FIRST STAGE PRESSURE TRANS-MITTER FAILS LOW	D	03/02/90	
RX27	STM GEN FEEDWATER INLET TEMPERATURE TRANSMITTER FAILS HIGH	D	03/02/90	

Test Number	Title	Type	Approved Date	Comments
RX28	STM GEN FEEDWATER INLET TEMPERATURE TRANSMITTER FAILS LOW	D	03/02/90	
RX29	FEEDWATER HEADER PRESSURE TRANSMITTER FAILS HIGH	D	03/02/90	
RX30	FEEDWATER HEADER PRESSURE TRANSMITTER FAILS LOW	D	03/02/90	
RX31	STEAM GENERATOR WIDE RANGE LEVEL TRANSMITTER FAILS HIGH	D	03/02/90	
RX32	STEAM GENERATOR WIDE RANGE LEVEL TRANSMITTER FAILS LOW	D	03/02/90	
RX33	STEAM GENERATOR FEEDWATER CONTROL SYSTEM FAILS TO MANUAL	D	03/02/90	
RX34	ADFCS MAIN FLOW CONTROL VALVE OUTPUT CARD FAILURE	D	03/02/90	
RX35	ADFCS BYPASS FLOW CONTROL VALVE OUTPUT CARD FAILURE	D	04/12/90	

Steam Generator System

Test Number	Title	Type	Approved Date	Comments
SG01	STEAM GENERATOR TUBE LEAK	V	01/28/91	
SG02	STEAM GENERATOR TUBE RUPTURE	V	01/28/91	
SG03	STEAM GENERATOR BLOWDOWN CONTROL VALVE FAILS OPEN	D	10/25/90	FAILED

Safety Injection System

Test Number	Title	Type	Approved Date	Comments
SI01	BOTH BORIC ACID TANK VALVES FAIL TO OPEN IN AUTO	D	10/25/90	
SI02	SI LOOP A COLD LEG INJ CHECK VALVE FAILURE	D	10/25/90	
SI03	BORIC ACID TANK VALVE FAILS TO CLOSE ON LOW-LOW LEVEL IN THE PRESELECTED BORIC ACID TANK IN AUTO	D	10/25/90	
SI04	SAFETY INJECTION PUMP TRIPS	D	03/02/90	
SI05	SAFETY INJECTION PUMP FAILS TO START AUTOMATICALLY	D	03/02/90	
SI06	SI ACCUMULATOR LEAKAGE	D	10/25/90	
SI07	SI ACCUMULATOR CHECK VALVE LEAKAGE	D	10/25/90	
SI08	SI ACCUMULATOR RELIEF VALVE LEAKAGE	D	10/25/90	
SI09	SI COLD LEG INJ LINE RUPTURE INSIDE OF THE ANNULUS	V	01/25/91	

Test Number	Title	Type	Approved Date	Comments
Turbine Control System				
TC01	TURBINE STOP VALVE FAILS TO CLOSE WHEN REQUIRED	D	03/02/90	
TC02	TURBINE STOP VALVE FAILS CLOSED	D	03/02/90	
TC03	TURBINE CONTROL SYSTEM CYCLING OUTPUT	V	01/15/91	
TC04	TURBINE CONTROL VALVE FAILS OPEN	D	01/25/91	FAILED
TC05	TURBINE CONTROL VALVE FAILS CLOSED	D	10/25/90	
TC06	REACTOR PROTECTION SYSTEM FAILS TO TRIP TURBINE	D	03/02/90	
TC07	TURBINE CONTROL INTERCEPT VALVE FAILS CLOSED	D	03/02/90	
TC08	TURBINE CONTROL FAILURE DURING TURBINE ROLL	D	10/25/90	
TC09	TURBINE CONTROL FAILURE CAUSING TURBINE RUNBACK	D	01/15/91	
TC10	TURBINE CONTROL FAILURE CAUSING AN INCREASE IN POWER WITHOUT DEMAND	D	10/25/90	
TC11	COMPLETE TURBINE TRIP FAILURE	D	01/08/91	FAILED
TC12	TURBINE TRIP	D	10/25/90	
TC13	ELECTRICAL HYDRAULIC CONTROL PUMP TRIP	D	03/02/90	
Turbine System				
TU01	LOSS OF TURBINE LUBE OIL SUPPLY	V		HOLD
TU02	TURBINE GENERATOR VIBRATION	V	10/25/90	
Chemical and Volume Control System				
VC01	REACTOR COOLANT PUMP #1 SEAL FAILURE	V	01/28/91	
VC02	REACTOR COOLANT PUMP #2 SEAL FAILURE	D	01/25/91	
VC04	POSITIVE DISPLACEMENT CHARGING PUMP TRIP	D	07/24/90	
VC05	STUCK OPEN CHARGING PUMP RELIEF VALVE	D		HOLD
VC06	REGENERATIVE HEAT EXCHANGER LEAKAGE	V	01/28/91	
VC07	LETDOWN HEAT EXCHANGER LEAKAGE TO ATMOSPHERE	V	01/25/91	
VC08	LETDOWN HEAT EXCHANGER TUBE RUPTURE TO CCW SYSTEM	D	01/15/91	
VC09	LETDOWN LINE LEAKAGE INSIDE CONTAINMENT	V	01/08/91	

Test Number	Title	Type	Approved Date	Comments
VC10	CHARGING PUMP COMMON DISCHARGE HEADER RUPTURE	V	01/15/91	
VC11	CHARGING LINE LEAKAGE INSIDE CONTAINMENT	V	01/28/91	
VC12	EMERGENCY BORATION VALVE STUCK OPEN	D	01/28/91	
VC13	LETDOWN LINE RELIEF VALVE FAILURE	D	01/15/91	
VC14	VOLUME CONTROL TANK RELIEF VALVE FAILURE	D	01/28/91	
VC19	LOSS OF AIR TO CHARGING PUMP SPEED CONTROLLER	D	01/28/91	
VC20	CCW RETURN FROM LETDOWN HEAT EXCHANGER FAILS CLOSED	D	01/15/91	
VC21	REACTOR COOLANT PUMP THERMAL BARRIER TUBE FAILURE	V	01/28/91	

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990

APPENDIX 9

LER TESTING ABSTRACTS

The following list of Licensee Event Reports (Reportable Events) and Significant Operating Events were tested on the Prairie Island Simulator between 1/1/91 and 1/20/91. The initial conditions for each test were chosen from the available protected IC sets and then manipulated to achieve the initial conditions which best matched the plant conditions in the event report. Simulator malfunctions, remote functions, I/O overrides and control manipulations were then used to recreate the event and the simulator response was compared to the plant response documented in the event report.

LER Number	Title	Test Date	Comments
P-RE-1-88-1	Procedure Inadequacy Covering Operation Of RHR Pumps In Recirculation Mode	1/19/91	Correct Response
P-RE-1-88-2	Autostart Of 12 And 22 Cooling Water Pumps Due To Air Binding Of 11 Cooling Water Pump	1/19/91	Correct Response
P-SOE-1-88-10	Loss Of DC Power To 12 Circulating Water Pump	1/19/91	Correct Response
P-SOE-1-88-14	Loss Of Power To IRPI Stacks	1/19/91	Correct Response
P-RE-1-89-15	Actuation Of 122 Control Room Clean-up Fan	1/14/91	Correct Response
P-RE-2-89-2	Unit Trip Caused By AEH System Malfunction	1/15/91	Correct Response
P-RE-1-89-8	Autostart Of Aux Building Special Vent System Due To Rad Monitor 1R37 Spike	1/15/91	Correct Response
P-RE-1-89-5	Autostart Of 12 AFW Pump Due To Loss Of Bus 12 DC Power	1/15/91	Correct Response

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990

APPENDIX 9

LER TESTING ABSTRACTS

LER Number	Title	Test Date	Comments
P-SOE-2-89-1	Isolation Of Boric Acid Supply To The Charging Pumps	1/15/91	Correct Response
P-SOE-2-89-4	Trip Of 22 AFW Pump Due To Governor Valve Binding	1/15/91	Correct Response

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990

APPENDIX 10

EVALUATION OF THE PRAIRIE ISLAND SIMULATOR CONFIGURATION MANAGEMENT PROGRAM AGAINST THE ANS/ANSI 3.5-1985 REQUIREMENTS

Following are the requirements pertaining to a Configuration Management process contained in ANS/ANSI 3.5-1985 and the elements of the Prairie Island Simulator Configuration Management process which meet those requirements:

A. Configuration Management Requirements

> "Reference plant modifications shall be reviewed at least once per year and the simulator update design data shall be revised as appropriate based on engineering and training value assessment."
> [ANS-3.5-1985 5.2]

Reference plant modifications are tracked by the Lead Simulator Engineer using the plant Modification Index and Alteration Index. As modifications/alterations are completed in the plant they are reviewed by the Simulator Design Review Committee. The SDRC evaluates the effect of modifications on the simulator design and determines which modifications are to be incorporated into the simulation based on an assessment of training value. The modifications to be incorporated into the simulator are assigned Simulator Change numbers and are then tracked and completed similar to other simulator changes. Completed modifications/alterations are identified within one year and Simulator Changes which result from plant modifications are completed within one year. Simulator design data is updated by revision of the controlled plant drawings and technical manuals, and completion of the simulator change package.

> "The simulator shall be modified as required within 12 months following the annual ... update design data ..."
> [ANS-3.5-1985 5.3]

Simulator changes initiated as the result of a plant modification are completed within 12 months of the date the modification was turned over to operations (or closed out if there is no operations turnover date). However, significant modifications to the Control Room Control Panels or control systems are frequently implemented in the simulator prior to completion in the plant in order to provide training prior to use for operations.

> "[ANSI/ANS-3.5-1985] Section 5.2 ... requires that reference plant modifications be reviewed annually against the simulator and that the simulator update design data be revised as appropriate. This should be taken to mean that the first such annual review and update should take place within one year following the licensee's certification ..."
> [RG 1.149 C.4]

The first review of plant modifications was performed following delivery of the simulator in 1983. These reviews have been ongoing since that date.

> "The control panels and consoles that are simulated shall be designed to duplicate the size, shape, color, and configuration of the functionally simulated hardware of the reference plant."
> [ANS-3.5-1985 3.2.1]

> "The controls on panels and consoles that are simulated shall be designed to duplicate the size, shape, color, and configuration of the functionally simulated hardware of the reference plant."
> [ANS-3.5-1985 3.2.2]

> "All functionally simulated ... hardware shall replicate that in the reference plant control room."
> [ANS-3.5-1985 3.2.2]

The simulated control panels and consoles, and the controls on these panels and consoles, are designed to duplicate the size, shape, color and configuration of the functionally simulated hardware. To ensure that this duplication is maintained pictures of the plant control boards and consoles are taken periodically and compared to the simulator. All exceptions to this replication are identified to the Simulator Design Review Committee and reviewed to verify that they will not affect training. A list of these exceptions is is available to the instructors and is included in Appendix A.

> "Plant information shall be displayed to the operator in the same form and units that are available in the reference plant." [ANS-3.5-1985 3.2.2]

All plant indications for use by the operators are provided in the same form and units as are available in the reference plant. All meter scales match the reference plant meters and the plant process computer database matches the reference plant.

> "Meters, recorders, switches, annunciators, controllers, plant computer interface hardware and other components or displays that would function during normal, abnormal and emergency evolutions shall be included in the simulator". [ANS-3.5-1985 3.2.2]

All meters, rec 'ders, switches, annunciators, controllers, and plant proce s computer hardware on simulated panels are included in the simulation. Some components for the Unit 2 which are included on shared control panels are only partially simulated - these are simulated to the extent needed for Unit 1 operation. Some panels located in the control room behind the main control board are not included in the simulator. These panels are listed in the exceptions and have been determined to not affect training.

> "Consideration should be given to simulating as much of the control room environment as is reasonable and practical, for example, turbine noise, control rod step counter noise, flooring, obstructions and lighting." [ANS-3.5-1985 3.2.3]

Steam dump noises and some turbine noise effects are simulated. Control rod step counter noise is simulated. flooring in simulator is different than flooring currently in the plant control room however plans to replace flooring in simulator (due to wear of simulator carpetting) are proceeding. Ventilation noise in simulator does not match the plant control room ventilation noises. Improvements to decrease the noise level in the simulator have been completed however the noise level is still higher than the plant control room. Lighting level in the simulator control room is different than the plant control room and the ceiling grids do not match the plant control room.

> "Communications systems that a control room operator would use to communicate with an auxiliary operator or other support activities shall be operational to the extent that the simulator instructor, when performing these remote activities, shall be able to communicate over the appropriate communication system." [ANS-3.5-1985 3.2.3]

The following communications systems are used in the plant to communicate with auxiliary operators and other support activities:

- Plant telephone system
- Plant page (Gaitronics)
- Sound powered phone system
- Radio pagers

Plant radio system
Intercom system
Auto ring line to the system dispatcher

All communications systems except the radio pagers and the plant radio system are operational in the simulator and allow the simulator instructor to act as the auxiliary operator. Additionally, a pair of portable radios is available on the simulator to allow simulation of radio communication with auxilliary operators similar to the plant system.

> "Simulators ... shall be based on actual or predicted plant configuration and performance "
> [ANS-3.5-1985 5.0]

The simulator modelling is based on actual plant performance and controlled plant drawings and technical manuals. The reactor core modelling is based on predicted performance obtained from core design models. Results from testing performed for simulator changes or simulator certification are compared to actual plant performance, when available, or predicted plant performance.

> "When a limited change is made a specific performance test on the affected systems and components shall be performed."
> [ANS-3.5-1985 5.4.1]

All simulator changes (which are limited changes), which involve changes to the model, are tested prior to use for training.

B. Simulator Enhancement Requirements

> "The determination of the type and number of malfunctions to be simulated should be part of a systematic process for designing performance-based operator training curricula."
> [ANS-3.5-1985 3.1.2]

Determination of the type of malfunctions to be modelled is performed by the Simulator Design Review Committee during review of new malfunction requests. New malfunctions are requested by instructors as they develop operator training curricula following a systematic performance based process. The number of malfunctions to be simulated is limited only by the available computer resources and the manpower resources assigned to the simulator support.

APPENDIX 10

"The malfunction assessment process should utilize:
(a) Licensee Event Reports
(b) Probabilistic Risk Assessment studies
(c) NSSS and BOP manufacturer equipment availability/reliability data and technical information service bulletins
(d) local site considerations and plant-specific operating experiences
(e) NRC bulletins and circulars"
[ANS-3.5-1985 3.1.2]

Many licensee event reports, NRC bulletins and circulars and plant specific operating experiences are utilized by the instructors during development of training curricula. To ensure that these items are evaluated for additions or modifications of simulator malfunctions, a process has been set up to ensure that these items are reviewed by the simulator support group. Probabilistic Risk Assessment studies, NSSS and BOP manufacturer data and technical information will also be reviewed when these items are received.

"Student feedback should be evaluated as part of the review process."
[ANS-3.5-1985 5.2]

Student feedback is evaluated as part of the training program review process. Simulator discrepancies which are identified by students are written up by the responsible instructor.

PRAIRIE ISLAND SIMULATOR CERTIFICATION REPORT
1990

APPENDIX 11

DOCUMENTS AVAILABLE FOR TRAINING USE ON THE SIMULATOR

Following is a list of the manuals and procedures available for training use on the Prairie Island Simulator. The procedures and manuals which are controlled by the Prairie Island QA Program are indicated.

1. Technical Specifications	Controlled
2. Technical Specification Interpretations	Controlled
3. Administrative Controls Manual (5ACD & N1ACD)	Controlled
4. Administrative Work Instruction (5AWI & N1AWI)	Controlled
5. Emergency Plan with Implementing Procedures	Controlled
6. Operations Manual Volumes A, AB, B, C, D, E, F, G, H and I (C Manual contains the operating procedures)	Controlled
7. Alarm Response Procedures (C Procedures)	Controlled
8. Operations Temporary Memos and Special Orders	
9. Flow Diagrams	Controlled
10. Logic Diagrams	Controlled
11. SPDS Manual	Controlled
12. Surveillance Procedures (Control Room list)	Controlled
13. Operations Checklists	Controlled
14. NSP - Power Production Policies and Procedures	
15. Foxboro Control System Drawings	Controlled
16. Westinghouse Logic Drawings	Controlled
17. Electrical Distribution Drawings, Load Centers List, Panel List	
18. Prairie Island Tank Book	
19. Prairie Island Pump Curves Book	
20. Operations Section Work Instructions (SWI)	Controlled
21. Air Junction Box List	
22. Boration / Dilution Tables	