L.F. SILLIN, JR. NUCLEAR TRAINING CENTER

EXCELLENCE IN OPERATIONS

MILLSTONE UNIT 2 SIMULATOR
QUADRENNIAL REPORT
1993 - 1997

MILLSTONE UNIT 2 SIMULATOR

QUADRENNIAL REPORT

JUNE 1997

APPROVED:

MP2 Operations Manager — Date: 6/23/97

APPROVED:

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APPROVED:

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QUADRENNIAL REPORT SUMMARY

The Millstone 2 simulator was initially certified on June 30, 1989. Certification was accomplished through the Northeast Utilities Simulator Certification Program, which is also the vehicle for ensuring continued certification. Based on the results of the Performance Test, which was run over the past four years, the Millstone 2 simulator continues to demonstrate excellent physical and functional fidelity when compared to the reference unit. Our Simulator Certification Program contains a comprehensive testing program, as well as procedural controls to ensure that the Millstone 2 simulator retains its high degree of fidelity.

This submittal contains the following thirteen sections and thirteen attachments:

- Section 1 provides testing, goals, methodology and assumptions.

- Sections 2 through 10 review and summarize the individual tests, which make up the Millstone 2 Simulator Performance Test.

- Section 10 reviews and summarizes the procedural controls for maintaining certification of the Millstone 2 Simulator.

- Section 11 provides a list of open deficiencies on the Millstone 2 simulator. As of May 30, 1997 there were 58 open deficiencies on the Millstone 2 simulator (12 PDCR, 13 dynamic, 3 logic and 35 enhancements). A total of 255 deficiencies were dispositioned over the past four years.

- Section 12 discusses the testing sequence for the next four (4) year certification period (July 1997 through June 2001).

- Section 13 discusses changes which have been incorporated in the Millstone 2 simulator during the past four years.

- Attachments 1 through 13 provide supporting documentation for sections 1 through 12. The attachments are referenced in the appropriate sections of this summary. Attachment 12 provides a list of abbreviations and definitions. Attachment 13 details the experience levels of test personnel.

The Performance Tests described in sections 2 through 9 were performed by NRC licensed SROs, including two former Millstone 2 Shift Supervisors. As shown in the malfunction abstracts, computer code analytical predictions were used to the maximum extent possible for complex transients such as Loss of Coolant Accidents and Main Steam Line Breaks. Deficiencies identified during the Performance Tests are identified in the attached Performance Test abstracts.

NU, in taking no exceptions to ANSI/ANS 3.5, 1985 and Regulatory Guide 1.149, 1987, takes the following positions:

(1) Modes of operation specifically prohibited by the Millstone 2 Plant design or by Technial Specifications need not be certified. An example of this is "startup, shutdown, and power operations with less than full reactor coolant flow" (ANS-3.5, Section 3.1.1(7)). This mode of operation is specifically prohibited by the Millstone 2 Technical Specifications.

In those situations where the standard conflicts with the plant design or operating philosophy, the Millstone 2 plant design and/or Technical Specifications take precedence. NU has taken this position to ensure that the conduct of simulator operations is in accordance with approved plant procedures and the Technical Specifications.

(2) Acceptance criteria and satisfactory performance are predicated upon the ability of the operator to discern differences between simulator response and reference performance data and the effects these differences may have on subsequent actions and diagnostic abilities.

(3) With respect to the "Performance Testing Plan Change" section on Form 474, it should be recognized that NU's Performance Test Plan is an integral part of the Nuclear Simulator Engineering Manual. Changes to that manual will not be forwarded to the NRC unless they significantly alter the intent of the test program.

(4) Analog and digital process computer points not required for the conduct of training or examinations need not be tested.

(5) Testing of surveillances on redundant equipment or flowpaths is not required if the primary piece of equipment or flowpath is tested.

(6) In regard to the steady state testing portion of the yearly operability test, steam generator temperature was not evaluated. This is acceptable because Millstone 2 control boards do not include steam generator temperature indication.

(7) When applying the Steady State Operation Performance Criteria of ANS 3.5, Section 4.1 both instrument error and loop error are considered when evaluating the accuracy of a particular reading.

(8) ANS 3.5, 1985 Appendix B, B2.2.4 requires Relief Valve Flow to be recorded <u>if available</u>. Relief Valve Flow is not available and, therefore, is not recorded.

(9) Testing of all Input/Output (I/O) override capabilities is not required during testing of the Instructor Station. Testing a sample of I/O overrides is sufficient to demonstrate the simulator's capabilities. Specific I/O override points are to be tested, as required, during curriculum testing.

SIMULATOR CERTIFICATION PROGRAM OVERVIEW

The continuining mission of our certification program is to:

- Ensure that the simulator has the capability to support the training program.

- Ensure certification is maintained in a cost-effective manner and addressing the specific requirements NRC 10CFR55.45 (b), recommendations of Regulatory Guide 1.149 and the guidance of NUREG 1258.

- Ensure compliance with the provisions set forth in ANSI/ANS 3.5, 1985.

The effort required to accomplish this mission has been grouped into three main components: Definition of the Scope of Simulation, Validation of the Scope of Simulation, and Configuration Management. NU has put in place a collection of formal procedures called the Nuclear Simulator Engineering Manual, to direct all aspects of the certification process and ensure compliance with the regulatory requirements. The NSEM is a departmentally controlled document to ensure consistent application.

The Scope of Simulation that NU is certifying is based upon the NU Simulator Instructor Guides, which encompass:

- all events specified in ANSI/ANS-3.5, 1985 and Regulatory Guide 1.149, 1987 and 10 CFR55.59 (c)(3)(i),

- the training requirements (LOIT/LORT) as specified in the various plant start-up, operating and emergency procedures, and

- outside events (e.g., selected LERs, plant design changes, etc.) that affect the training programs and/or the trainer configuration.

Validation of the defined Scope of Simulation consists of two main groupings of activities: (1) Performance Testing and (2) Verification. A specific performance test was developed for the Millstone 2 simulator, which fulfills the testing provisions of ANS 3.5, 1985; INPO 86-026, Guidelines for Simulator Training; and NUREG 1258. Included are the following test categories:

- Malfunctions (Major and Minor)
- Normal Operations
- Instructor Interface
- Operability
- Real-Time Simulation

There are also activities, which are requirements of certification, but do not fit neatly within the context of performance testing, namely:

- Defined Simulator Operating Limits
- Plant-Referenced Physical Fidelity
- Approved Initial Conditions

The Millstone 2 Simulator Performance Test is a dynamic document and is the primary mechanism for validating simulator performance and fidelity. As such, it is updated to reflect modifications made to the simulator and/or new reference plant performance data. The entire performance test is repeated over 4 years. Malfunction testing is accomplished at a rate of approximately 25% per year. Both Operability Testing and the Physical Fidelity report are done annually. Section 1 through 11 provide a detailed summary of the testing and results for the period from July 1993 through June 1997.

NU's Certification Program provides control over the configuration of the Millstone 2 Simulator to ensure that it can effectively support the training mission and that regulatory commitments are satisfied.

The main components of Configuration Management are: Design Data Base, Documentation, Modification Control and Scope of Simulation Expansion.

The intent of the Simulator Design Data Base is to have available the complete data on which the simulator is designed, and on which upgrading is based. The specific data which forms the design basis for the current Millstone 2 simulator hardware configuration and software models has been identified and validated. It is NU's philosophy here not to create a separate, new data base, but to utilize existing controlled reference plant design data bases. As such, NU utilizes the latest revision of plant documents and relies on the formal plant design change process for notification of modifications and transmittal of pertinent information. Open Simulator Design Changes constitute the Update Design Data Base described in ANS 3.5, 1985. In addition, there is also simuator-specific documentation which is needed for certification and/or maintenance of the simulator. While this documentation is controlled and updated, it is not considered to be part of the Simulator Design Data Base.

NU has in place a modification control process that manages the implementation of design changes on the Millstone 2 simulator and complies with NRC recommendations and industry standards regarding configuration control. Procedures within the NSEM control the coordination, resolution and documentation of identified differences between the simulator and reference plant. A Simulator Configuration Control Committee (SCCC) has been established to be responsible for overall simulator design control and prioritizes deficiency reports (DRs). The SCCC is comprised of 1) Operations Manager, Millstone 2 (Chairman), 2) Manager, Process Computers and Simulators, 3) Supervisor, Simulator Computer Engineering, 4) Supervisor or Assistant Supervisor,

MP2 Operator Training 5) MP2 Simulator Operations Assistant, 6) MP2 Software Engineer, and 7) MP2 Hardware Technician. A data base is used to track the status of identified simulator discrepancies.

The need for expanding the Scope of Simulation is determined by monitoring outside events which have the capability for affecting the training programs or simulator configuration. These include:

- New reference plant performance data
- Student feedback
- Curriculum testing
- New simulator Instructor guides
- Major plant design changes
- Licensee Event Reports (LERs)
- Significant Operating Event Reports (SOERs)
- Plant Design Change (DCRs, Minor Mods, IEEs, etc)

1. Testing Goals, Methodology and Assumptions

The NU Simulator Certification Program, goals, methodologies and assumptions were established to ensure an efficient, effective and comprehensive approach to testing. Certain elements of this testing philosophy are:

- Testing should be conducted during normal, abnormal and emergency conditions.
- The Simulator response, as verified by testing, during normal, abnormal and emergency conditions shall meet the following criteria necessary to support the contents of the training curriculum:
  - Correct operator diagnosis is possible.
  - Capabilities for operator intervention to mitigate events exist.
  - Actions or inaction taken by operators results in similar response as in the reference plant.
  - Alarms and automatic system actuations shall occur such that operator diagnosis and response is not adversely affected.
- Deficiencies found during testing which violate these criteria shall be documented by generating a Deficiency Report (DR), to be dispositioned in accordance with NSEM 5.01, Simulator Modification Control.
- The requirements of ANS 3.5 shall be implemented.
- Simulator controls (used for training) such as switches, annunciators, meters, controllers, recorders, lights, keylocks, pushbuttons, etc., should be tested.
- Process computer points needed to support training should be tested.
- A combination of operating experience, engineering judgment and analytical results should be used to test the simulator response to Major Malfunctions such as Large Break LOCA, Excess Steam Demand, etc.

During the development and conduct of specific testing it became necessary to establish additional guidance. This was done to more effectively apply the provisions of ANS 3.5 and respond to the unique attributes of each test. This additional guidance is summarized:

NORMAL OPERATIONS TRAINING

- ANS 3.5, Section 3.1.1, item 7 (operation with less than full flow) need not be tested. This evolution is prohibited by the Millstone 2 Technical Specifications.

- Testing of surveillances on redundant equipment or flowpaths is not required if the primary piece of equipment or flowpath is tested. For example, if the Facility I Service Water Pump surveillance is performed, the Facility II Service Water Pump surveillance need not be performed.

YEARLY OPERABILITY TESTING

STEADY STATE TESTING

- M. itoring Steam Generator Temperature as specified by ANS 3.5 Appendix B, B2.1, shall not be done. Millstone 2 has no control board indication for Steam Generator Temperature.

- Calculation of simulator steady state tolerance allowances. For example:

RCS pressure
* RCS pressure, range 1500 to 2500 psia
* Loop range, 2500 -1500 = 1000 psia
* Allowed tolerance = 1%
* Loop accuracy = 0.5%
* At all power levels, RCS pressure reads 2250 psia

Therefore, the tolerance applied to the simulator is:
* 1000 psia x 1.5% = 15 psia

RCS temperature
* RCS T_H range 515°F to 615°F
* Loop range 615 - 515 = 100 °F
* Allowed tolerance = 1%
* Loop accuracy = 0.5%

Therefore, the tolerance applied to the simulator is:
* 100 °F x 1.5% = 1.5 °F

TRANSIENT TESTING

- During testing of the Maximum Rate Power Ramp (reference ANS 3.5, Appendix B, B2.2, item 7), the restoration to 100% power cannot be done without operator action and will not be tested.

- All parameters required by ANS 3.5, Appendix B, B2.2.4 are to be tested at 0.25 second intervals except as noted below:

  - Relief Valve Flow is not to be recorded. Recording capabilities do not exist for this parameter.

  - This is acceptable because Appendix B, B2.2.4 requires recording these parameters <u>if available</u>.

- In the case where the comparison between simulator response and reference plant response results in a discrepancy, that discrepancy is resolved via the Deficiency Report process and an appropriate retest conducted.

<u>OTHER TESTING</u>

Testing of all Input/Output (I/O) override capabilities is not required during testing of the Instructor Station. Testing a sample of I/O overrides is sufficient to demonstrate the simulator's capabilities. Specific I/O override points are to be tested, as required, during curriculum testing.

2. **<u>Normal Operations Test</u>**

ANSI/ANS 3.5 (1985) Section 3.1.1 requires the simulator to be capable of performing normal plant evolutions and surveillances.

The normal operations and surveillances required by ANS 3.5 Section 3.1.1(1), (2), (3), (4), (5), (6), (8) and (10) were performed using "then current" copies of Millstone 2 Operating Procedures and Surveillances. As discussed, the operating condition specified in Section 7 is prohibited by Millstone 2 technical specifications and was therefore not tested. ANS 3.5 Section 3.1.1 (9) was tested by the Reactor Core System Test.

NSEM Procedure 4.10, "Normal Operations Verification" contains the generic guidance used to write the Millstone 2 Simulator Normal Operations and Surveillance Test.

Attachment 1 contains the Millstone 2 Simulator test procedure used for Normal Operations and Surveillance testing. Using "then current" copies of Millstone 2 Operating Procedures the following sequence of operations was tested on the Millstone 2 Simulator:

- The Simulator was initialized to Cold Shutdown conditions.
- A Plant Heatup was performed.
- A Nuclear Startup was performed.
- A Plant Startup was performed.
- A Load Increase to 100% power was performed.
- A Reactor Trip was initiated.
- A Reactor Trip recovery was performed.
- A Nuclear Startup was performed.
- A Plant Startup was performed.
- A Load Increase was performed.
- The Simulator was reinitialized to 100% power.
- A Plant Shutdown was performed.
- A Reactor Shutdown was performed.
- A Plant Cooldown was performed until Cold Shutdown was reached.

The specific Millstone 2 Operating Procedure and Surveillance Procedure titles and numbers used in this test are listed in the individual steps of the test procedure shown in Attachment 1. Attachment 2 contains a concise list of 64 Surveillances that the Millstone 2 simulator is capable of performing. As shown on this list, some surveillances were exempted from testing if they were simply a repeat of the same type of test on a different Electrical Facility.

All Normal Operations and Surveillance Testing will be re-performed over a four year interval as described in Section 12 of this document.

3. Malfunction Tests

ANSI/ANS 3.5 (1985) Section 3.1.2 requires 25 types of malfunctions to be available on a Simulator. The Millstone 2 Simulator is capable of these 25 malfunctions that are applicable to PWRs.

Attachment 3 contains an index of all certified malfunctions available on the Millstone 2 Simulator. All malfunctions listed are certified malfunctions except those few that are annotated with an asterisk and associated note. This index is organized alpha-numerically by plant system. Attachment 12 contains a list of definitions for plant system abbreviations.

Each certified malfunction has its own test procedure. Guidance for writing malfunction test procedures and conducting tests is contained in:

- NSEM Procedure 4.04, Major Malfunction Testing
- NSEM Procedure 4.05, Malfunction Testing

Malfunctions which cause major integrated plant effects, such as Large RCS Breaks, Main Steam Line Breaks, etc., have their respective malfunction test procedures written and tests conducted per the guidance in NSEM 4.04. For these "major" malfunctions, computer code analytical data or actual data (if available) is typically used to verify correct malfunction response. Analytical data was obtained from the following documents/sources:

- CEN 128, "Response of a CE NSSS to Major Transients"

- CEN 268, "Justification of Trip 2/Leave 2 RCP Strategy During Transients"

- Millstone 2 Final Safety Analysis Report (FSAR)

- Northeast Utilities generated "Best Estimate" cases, specific to Millstone 2

An example of a malfunction test written and conducted via the NSEM 4.04 process is contained in Attachment 10. The example in Attachment 10 is labeled "RC04: Unisolable RCS Leak on the Reactor Vessel Head Vent."

Malfunctions which do <u>not</u> cause large integrated plant effects have their respective malfunction test procedures written and tests conducted per the guidance in NSEM 4.05. This type of malfunction is typically an instrument malfunction, a controller malfunction, a pump trip, etc. Malfunction tests in this category are typically "Best Estimate" Analysis. "Best Estimate" Analysis means a Millstone 2 Subject Matter Expert utilizes his experience, operating procedures, piping and instrument drawings, electrical drawings and possibly hand calculations to estimate proper Simulator response. An example of a malfunction test written and conducted via the NSEM 4.05 process is contained in Attachment 10. The example in Attachment 10 is labeled "CC11: RBCCW Pump Degraded Performance."

In summary, <u>each</u> of the certified malfunctions has its own malfunction test procedure and its own "Cause and Effect" description. Due to their large volume, only 2 malfunction test procedures are being provided in Attachment 10, as examples. These malfunction test procedures are available for review upon request.

ANS 3.5 Section 3.1.2 requires 25 specific malfunctions to be available on a Simulator. In order to facilitate NRC review of this submittal, Attachment 3 contains a cross reference of

these 25 specific malfunctions to the applicable Millstone 2 Simulator malfunctions. Listed in Attachment 3 under each of the 25 ANS 3.5 required malfunctions are:

- Abstracts from Millstone 2 Simulator malfunction tests providing:
  - The name of the malfunction
  - The date the test was performed
  - Whether the malfunction is variable, and if so, its range and what severity was tested
  - Starting conditions and end point conditions
  - The source of baseline or reference data
  - Details of identified deficiencies

- At the end of each of the 25 sections is a list of other Millstone 2 Simulator malfunctions which meet the ANS 3.5 requirement, but for which no abstract is provided.

Attachment 3 contains approximately 55 malfunction test abstracts of the 235 certified Millstone 2 Simulator malfunctions. These 55 malfunction abstracts were chosen to cover the major malfunctions of interest (Loss of Coolant, Steam Line Break, etc.) and to cover at least one malfunction in each of the 25 required ANS 3.5 malfunction types. The malfunction "Cause and Effect" descriptions may be used as abstracts for other certified Millstone 2 Simulator malfunctions.

ANSI/ANS 3.5 (1985) Section 3.4.2 requires that provisions be available for incorporating additional malfunctions. The Millstone 2 Simulator has this capability.

All certified malfunctions will be retested over a four year interval, as described in Section 12 of this document.

4. Yearly Operability Testing

ANSI/ANS 3.5 (1985) Section 5.4.2 and Appendix B specify Annual Operability Testing requirements. The methodology used to write and conduct Yearly Operability Tests is described in NSEM Procedure 4.09, "Simulator Operability Testing". Using the guidance provided in NSEM-4.09, a Yearly Operability Test specific to the Millstone 2 Simulator was written. This Millstone 2 specific test procedure is not contained in this submittal, but is available for review on request.

Yearly Operability Testing will be performed on an annual basis.

The Yearly Operability Testing performed consisted of the following items:

- Steady State Testing at approximately 30% power, 50% power and 96% power
- Transient Performance Testing for ten (10) transients

Reference Plant data obtained at 30%, 50% and 96% power during the August 1995 refuel startup was used as the basis for Steady State Testing. Utilizing the Reference Plant data, comparisons were made between the Simulator and Reference Plant for approximately 80 selected critical and non-critical points.

These 80 points include all those listed in ANS 3.5 Section B2.1 with one exception: Millstone 2 has no control board Steam Generator Temperature indication.

Acceptance criteria for the Steady State were based on ANS 3.5 Section 4.1. No deficiencies were identified.

Transient Performance Testing was performed for ten transients. The ten transients tested were those described in ANS 3.5 Section B2.2, with one exception. This exception concerns ANS 3.5 Section B2.2 Transient #7, which is a "Max rate power ramp (100% down to 75%, backup to 100%)". The Millstone 2 Simulator test was performed by doing a maximum rate power ramp from 100% power down to 75% power only, and not back up to 100% power. A rapid rate power increase from 75% to 100% power would violate the physical design and trip criteria for Millstone 2. Millstone 2 does not have Automatic Rod Control, nor any automatic load reject logic, but does have a Variable High Power Trip. The Variable High Power Trip will actuate an automatic Reactor Protection System Trip on an approximate 9% power increase over the current setpoint. A rapid power increase would trip the plant by design, and therefore was not included in the Transient Performance Testing.

The ten transients described in ANS 3.5 Section B2.2 were analyzed using the parameters indicated in ANS 3.5 Sections B2.2.1, 2, 3, or 4, as appropriate. Attachment 8 contains abstracts of each of the ten transient tests.

5. Physical Fidelity

Comparisons of the MP2 simulator to the reference plant are conducted annually in the areas of panel simulation, instrument and control configuration and ambient operating environment. Identified discrepancies are evaluated to determine the consequences to the simulator's ability to be used as an effective training tool. This process is described in NSEM Procedure 4.12, "Simulator Physical Fidelity/Human Factors Evaluation". A complete set of photographs was taken of the Reference Plant Control Room in November 1995 and compared to the Simulator. No deficiencies that affect training were identified. Those differences between the Simulator and Reference Plant Control Room which have been dispositioned as "not affecting training" are described in Attachment 9, "Physical Fidelity

Summary Report". To ensure continued physical fidelity, photographs will be taken as needed for Reference Plant Control Boards that have undergone changes.

NU has a strong commitment to maintain the Millstone 2 Simulator up to date with the Reference Plant Control Boards in a timely manner. NSEM Procedure 6.04, "Major Plant Changes", addresses controls on major design changes (such as Control Room Design Review) that challenge a "plant referenced simulator" to remain an effective training tool. Minor plant changes are addressed within the time constraints of ANS 3.5 Sections 5.2 and 5.3.

6. Initial Conditions Testing

Initial Conditions Testing was performed in February, 1989. NSEM Procedure 4.02, "Initial Conditions", describes this process. The Millstone 2 Simulator has capabilities for storing 100 Initial Conditions.

All Certified Initial Conditions (ICs) were reviewed to ensure equipment alignments, plant conditions, remote functions, etc., were reasonable for the stated IC conditions. The first four pages of Attachment 4 contain the checklist used for reviewing all certified ICs. The number of certified ICs may vary between 25 to 30 depending on simulator training requirements. Twenty-five ICs have been designated as the "base" group of ICs that will be maintained certified. These 25 certified ICs cover a broad range of conditions such as:

- Beginning of Core Life (BOL)
- Middle of Core Life (MOL)
- End of Core Life (EOL)
- Different Operating Modes such as Cold Shutdown, Hot Standby, Critical Approach, etc.
- Different Power Levels

An IC used for training (or exam) is:

- A certified IC
- Developed from a certified IC using approved plant procedures.

Only certified ICs are used for training or exams. Listed in Attachment 4 for each of the 30 ICs are the following:

- RCS T_{AVE} (^{o}F)
- Pressurizer Pressure (psig)
- Reactor Power (%)
- RCS Boron Concentration (ppm)

- Xenon Reactivity (pcm)
- Remarks section which describes the basic conditions of the IC

Certified ICs are maintained up-to-date as plant changes and procedure changes occur.

7. <u>Simulator Operating Limits Testing</u>

The process used for identification and action concerning Simulator Operating Limits is described in NSEM Procedure 4.08, "Simulator Operating Limits".

Two methods are used to prevent negative training when Simulator Operating Limits are reached: freezing the simulator or administrative controls. The Reference Plant design limits and/or Simulator model limits which cause the Simulator to "freeze" are listed below.

Also listed are the administrative Simulator Operating Limits which are controlled by the simulator instructor. These administrative limits are implemented through simulator instructor training and cautions placed in those Simulator Instructor Guides where such situations could occur.

- The Millstone 2 Simulator will go to "freeze" if any of the following conditions exist:

- RCS Pressure	> 2750 psia
- Containment Pressure	> 60 psig
- S/G Pressure	> 1300 psia
- Fuel Temp	> 5000°F
- Fuel Clad Temp	> 3300°F

- The simulator instructor can determine which of these operating limits caused the simulator to go to Freeze by reviewing a CRT display in the instruction station.

The following simulator operating limits are dealt with administratively. These limits are all results of Simulator model limitations:

- RCS Pressure should not exceed 2000 psi greater than Steam Generator Pressure (Steam Generator Tube/Tubesheet D P).

- Axial Xenon Oscillations are always divergent on the Simulator. This is not a problem in normal training sessions due to their short duration.

- The Chemical and Volume Control System (CVCS) if allowed to reach saturation, will not show any flashing or flow oscillation since it is modeled as a single-phase system.

- The reactivity worth of stuck Control Element Assemblies (CEAs) is too small.

The instructors are also informed of these operating limits and other abnormal responses by Form 7.3 of NSEM-4.08 that follows.

The following simulator responses have been identified and not yet corrected:

- High Pressure, high temperature water through the PORVs, i.e., once through cooling with the PZR full. The RCS pressure and RV level become abnormal with large pressure and RV level swings.

- Reactor Vessel Level below the Hot Leg and RCS at saturated conditions, Incore Tc indicated.

- End of cycle Large Main Steam Line break and a stuck out CEA the simulator might not show a short return to criticality.

8. Instructor Station Testing

During June 1994, Simulator Instructor Station Testing was performed as described in NSEM procedure 4.11, "Instructor Station". No deficiencies were identified.

Instructor Station testing verified correct operation of the following features of the Millstone 2 Instructor Station.

- Backtrack
- Fast time, for each of the eight (8) modeled Fastime parameters
- Slow time
- Boolean Trigger
- Composite Malfunction
- Variable Parameter Control
- Freeze
- Snapshot

To verify the I/O override feature of the Millstone 2 Simulator, a small number of the following points were tested to verify proper operation.

- Analog Outputs
- Analog Inputs

- Digital Inputs
- Digital Outputs
- "Crywolf" Annunciator feature
- Annunciator Override

The purpose of the I/O override feature testing was to verify the feature itself, not every I/O override point. The Millstone 2 simulator has the ability to I/O override essentially every point in the simulator. Curriculum testing of a simulator lesson plan will require the testing of any individual I/O override point to be used in training or exams, thereby verifying the individual I/O override points to be used.

Refer to NSEM Procedure 4.11 for the Instructor Station Test Procedure. The data taken from this test is not contained in this submittal, but is available upon request.

The Instructor Station test will be repeated once every four years.

9. **Real Time Testing**

Real Time Testing was performed in June, 1997, per NSEM procedure 4.13, "Real Time Simulator Verification".

The purpose of this test is to verify that all simulation models are running in real time and is accomplished by:

- Installing a software frame counter in each of the 20 frames.

- Running each of the following scenarios:

  - Turbine trip
  - Steam-Line break at 100% severity
  - RCS hot-leg double-ended LOCA
  - RCP locked rotor

- Recording frame counters, simulator exercise time and the worst case execution time for each frame at the end of each scenario.

- Ensuring the frame counter values and simulator exercise time are consistent with the stop watch time (differing no more than 2 seconds for a 10-minute test run).

- Ensuring the worst case execution time for each frame is less than 50 ms.

The results of these tests show that the Millstone 2 simulator performs in real time and no deficiencies were identified.

This test will be repeated once every four years or at any time a question exists that the Millstone 2 Simulator is not running in real time.

10. Ensuring Continuing Performance of the MP2 Simulator

To ensure that the MP2 Simulator performance remains in compliance with ANSI/ANS 3.5 (1985), Reg Guide 1.149 and 10 CFR 55.45 the following procedural controls have been implemented:

Major Plant Modifications - The Millstone 2 Simulator was certified as a Plant Referenced Simulator. Significant Reference Plant Control Room changes, such as from Control Room Design Review modifications, must receive special consideration due to their potential major impact. NSEM Procedure 6.04, "Major Plant Modifications", addresses this concern. This procedure ensures that major plant modifications affecting the Reference Plant Control Room are reviewed and acted on in a timely manner. This ensures that training and exams continue to be performed on a valid plant referenced Simulator.

Plant Design Changes/Procedure Changes

Plant Design Changes and Procedure Changes are sent to the Training Department to be reviewed for training impact and Simulator impact. This assures that both training and the simulator are continually evaluated and updated as plant changes occur. Procedural controls covering this review process are in Training Procedures not provided in this submittal.

Plant Design Changes requiring Simulator modifications are handled within the time allowed by ANS 3.5 Section 5.2 and 5.3. A recently instituted self-assessment effort to review reference plant design changes which occurred after simulator delivery identified one minor modification which had previously not been identified. This modification involved replacement of two 3-position control board handswitches with 2-position handswitches and has subsequently been completed(outside of the time allotted by ANS 3.5). There was no impact on simulator operations or training.

Student Feedback - Student (licensee) feedback is an important input to Simulator Fidelity. NSEM Procedure 6.01, "Student Feedback", describes how student feedback is requested. Regular written feedback is requested from students on simulator training and fidelity. Response has been frequent and favorable. Also, every one to two years a student survey on Simulator Fidelity is performed. Attachment 5 contains the results of the survey

performed in October, 1996. The summary letter also contains the disposition of action to be taken for each item.

Reference Plant Performance Data - As plant events occur, data will be retrieved and evaluated to validate Simulator Fidelity. NSEM Procedure 6.03, Collection of Plant Performance Data", covers the collection of reference plant performance data.

Development of New Simulator Training Guides - Simulator Certification Procedure NSEM 6.02, "Development of New Simulator Guides," covers requirements for new Simulator training guides. This ensures that new Simulator training guides use only certified remote functions, certified malfunctions, certified Initial Conditions and do not exceed any Simulator Operating Limits.

Simulator Certification Documentation - As the Millstone 2 Simulator is modified, appropriate simulator certification documentation needs to be updated. NSEM Procedure 5.02, "Retest Guidelines" covers updating of the Performance Test.

Reference Plant Design Changes may result in simulator changes such as:

- Adding or deleting remote functions
- Adding or deleting malfunctions
- Changing remote functions or malfunctions
- Changing Performance Tests or their criteria

It is Northeast Utilities' interpretation that simulator documentation may be modified as the Reference Plant changes without requiring the submittal of an NRC Form 474 update. Changes to simulator certification documentation will be made per the attached NSEM procedures. Updated materials will be sent at the next regular certification quadrennial report date, or upon NRC request.

11. Open Deficiency Report (DR) List

Simulator Modification Control Procedure NSEM-5.01 controls for the coordination, resolution, and documentation of identified differences between the simulator and its reference plant, and to maintain the integrity of the simulator hardware, software and design databases.

A Deficiency Report is a form used by the Operator Training Branch and the Simulator Comuputer Engineering Group to record all identified deficiencies between the simulator and reference plant.

A Simulator Design Change is a documentation package, consisting of relevant Deficiency Reports and other forms, which is designed to track the resolution of Deficiency Reports and ensure that ANSI/ANS 3.5 is satisfied.

Attachment 6 contains a current listing of all Millstone 2 simulator open Deficiency Reports (DRs) associated with certification. These DRs will be dispositioned[1] in accordance with their importance to training.

12. <u>Next 4-Year Schedule, (July 1997 to June 2001)</u>

The entire MP2 performance test will be repeated over a four-year interval as described in Attachment 7. The schedule shown in Attachment 7 has been written based on the guidance provided in NSEM Procedure 4.07, "Master Test Schedule".

The following tests must be performed every year:

- Annual Operability Testing
- Physical Fidelity Verification

The following tests must be performed over a 4-year interval:

- Normal Plant Evolutions and Surveillance Testing
- All Certified Malfunctions
- Instructor Station Testing
- Real Time Testing

[1] "Dispositioned" means 1 of 2 things will occur. Either: 1) the DR will be fixed, or 2) if the DR cannot be fixed, the problem may be added to the Simulator Operating Limits if it is significant. It is important to recognize that prioritization of resolving DRs is a dynamic process. As new DRs are generated, their importance will be evaluated and the order of DR resolution appropriately changed, if necessary, to ensure the highest quality training is presented.

13. Administrative Modifications to the Simulator Certification Quadrennial Reporting Program

The MP2 Simulator Performance Testing program has undergone administrative modifications since the last quadrennial report submitted in June 1993. The following is a synopsis of those changes:

System Tests:

The MP2 Simulator has undergone over ten years of Performance Testing in support of 1) acceptance from the vendor; 2) acceptance of modifications; and 3) certification and quadrennial reporting to the NRC. Performance Tests have been developed, selected, and used in accordance with the particular purpose to be achieved. One form of Performance Test was a detailed exercise of logic and flow paths associated with the simulated systems identified in the MP2 simulator design specification, e.g., Circulating Water System, Service Water System, Reactor Protection System, etc. This form of testing is called System Tests.

System Tests are resource intensive because of the simulator and personnel time required to achieve the level of detail necessary to test every element of the simulation. The value of these tests decreases as the individual elements of the simulation are confirmed to exist and perform correctly. The number of discrepancies identified reaches a point of diminishing marginal return on the effort expended. More importantly, the integrated response of the simulation elements becomes the key in determining simulator performance.

Within a direction to optimize the mission of the Simulator Certification Program, Simulator Computer Engineering (SCE) determined that System Tests were no longer justifiable, being neither timely, cost-effective, enhancing compliance, nor adding value to the training program. Thereby, the Systems Tests were discontinued as part of the Performance Tests, and are now used only when appropriate, for example, when new systems are installed.

Supporting Facts:

The acceptance tests from the vendor achieved the initial acceptance of contract commitments through a thorough review of performance at an extreme level of detail. Both factory acceptance tests (FAT) and site acceptance tests (SAT) resulted in the identification of a significant number of discrepancies. The FAT was completed in March 1985. The SAT was completed in June 1985. System Tests were very valuable during this phase of the Simulator life cycle. They were used to achieve a firm baseline of performance for the individual elements of the simulation. This baseline remains firm through rigorous conformance to a simulator change control process that was instituted from the original FAT and remains active to this day.

When the NRC required certification of plant referenced simulators the MP2 simulator was again tested in 1989 using the full Acceptance Test Procedure (ATP) that was used in the FAT and SAT Performance Tests. Discrepancies other than those originally identified in FAT and SAT were found, but the number was much lower than the original ATPs.

The first quadrennial cycle (1989 - 1993) after certification also employed System Tests. Very few discrepancies were found during conduct of the System Tests.

After the submittal of the 1993 four year report, it was determined that the performance of System Tests was no longer of value, that the other forms of Performance Testing were sufficient to achieve the mission, that System Tests were not a regulatory requirement or industry standard, and that System Tests could always be conducted should the need arise. Therefore, System Tests have been discontinued as a necessary part of Performance Testing.

Computer Platform Re-Host

In October 1993, a computer platform re-host was completed which replaced the Gould 32/87 processors and peripherals with a SUN SPARCcenter 2000 system and new peripherals. The re-host effort included complete benchmarking against the previous platform by using the Simulator Operability test. These tests included 1) instructor station test, 2) all annual operability tests and 3) all major/minor malfunctions required by NSEM 4.07 for 1993-1994. Any differences in the two benchmarks were resolved before the simulator with the new platform was returned to the Operator Training program.

MP2 Simulator Computer System Configuration

(A) Hardware

SPARCcenter 2000 40-MHz XDBus,
Fast SCSI-2/Buffered Ethernet Sbus Card (FSBE/S)
Internal SunCD Drive, 14-Gbyte 8mm Tape Internal Drive

Two 40MHz System Boards with Two 60MHz SuperSPARC-II
Modules each, No Memory

192-Mbyte of ECC Memory SIMMs
DSCSI Drive Tray with Four 2.9GB drives
fed by 2 Sbus Differential Fast/Wide Intelligent SCSI-2 Host Adapters (DWIS/S)

Three 20-inch Color Monitors, TurboGX Frame Buffers, and Cables

(B) Software

SUN Solaris 2.3 operating system
Sybase 4.9.2 relational database management system
Dataview 9.5 graphical tool runtime
NUSE (Northeast Utilities Simulation Environment)
NUXIS (Northeast Utilities X-Window Instructor Station)

NUSE

The Northeast Utilities Simulation Environment (NUSE) was developed in-house by the SCE staff. The real time portion of NUSE includes the Real Time Executives (Rtexec), Interactive Debugging Task (IDT), I/O module, etc., and provides the model execution sequencing, scheduling, the panel interfacing and on-line parameter monitoring. The off-line portion of NUSE includes tools and utilities used by engineers to develop, debug and maintain the simulation models.

NUXIS

Northeast Utilities X-Window Instructor Station (NUXIS) was also developed in-house by the SCE staff using Dataview's graphic tools NUXIS provides a window-based, point and click, graphical user interface for instructors.

NSSS Model Set Migration

In January 1995, new advanced NSSS models were installed on the simulator and made available to the Operator Training program. This migration was from the original Singer-Link NSSS models ready-for-training in May 1985 to a model set developed by ABB-Combustion Engineering. The acquisition and installation of the ABB NSSS model set included a rigorous series of acceptance tests exceeding the testing of the original models. The acceptance tests included a preliminary Factory Acceptance Test (FAT), a FAT, a Site Acceptance Test, a RELAP Benchmark Test, a Simulator Operability Test benchmark, and Major Malfunction Tests. These tests constituted a System Test for the NSSS. Several reports have been generated and retained for review. All discrepancies were resolved.

The ABB NSSS simulator model set includes the neutronics of the reactor core and the thermohydraulics of the RCS, secondary side of the steam generators and the main steam header.

The neutronics model is a three dimensional model based on a modified one and half group diffusion equation. Each fuel assembly is divided into ten axial nodes for a total of 2170 neutronic nodes. The thermohydraulics is a nonhomogeneous, non-equilibrium liquid and steam model. It models phase separation and occurrence of non-equilibrium conditions. The model solves mass conservation equations of liquid, mixture masses (liquid, liquid/steam,

steam), energy equations for the mixture and steam, and the conservation equation of the mixture momentum. The integration is an implicit integration of the coupled system. The momentum equation is solved for each path (junction). The pressure is solved locally based on masses and energies for each node. Phase separation is calculated with the use of drift flux model.

Physical Fidelity Verification

The June 1993 to June 1997 four year test plan called for annual full panel photographs of the reference plant to be taken and compared to the simulator. This was not done. Photographs and a report were prepared for the 93/94 period, pictures were taken for the 95/96 period, and a report was prepared for the 96/97 period. Since physical fidelity discrepancies are identified and dispositioned within the normal simulator modification process, no physical fidelity discrepancies resulted from the full panel photograph comparisons. A record of full panel photographs is maintained and updated on an "as needed" basis for documentation of the reference plant comparison. A record of identified discrepancies is maintained with training value assessments of the impact on actions to be taken by the operator. These records are retained and updated as needed within the normal simulator modification process. NSEM procedure 4.12, "Simulator Physical Fidelity / Human Factors Evaluation", has been updated to address these changes.

ATTACHMENT 1

MP2 NORMAL OPERATIONS AND SURVEILLANCE TESTING SEQUENCE

Figure 7.1

NORMAL PLANT EVOLUTIONS LIST

1. PLANT STARTUP

- o Will be tested by this procedure: YES [✓] NO [ ]
- o If no, state reason:
- o Operating Procedure(s) to be used: OP 2203
- o Unit specific Test Step numbers which will complete this requirement: Step 3.0

2. NUCLEAR STARTUP

- o Will be tested by this procedure: YES [✓] NO [ ]
- o If no, state reason:
- o Operating Procedure(s) to be used: OP 2202
- o Unit specific Test Step numbers which will complete this requirement: Step 2.0

3. TURBINE STARTUP AND GENERATOR SYNCHRONIZATION

- o Will be tested by this procedure: YES [✓] NO [ ]
- o If no, state reason:
- o Operating Procedure(s) to be used: OP 2203, OP 2323A, and OP 2324A
- o Unit Specific Test Step numbers which will complete this requirement:

4. REACTOR TRIP AND RECOVERY

- o Will be tested by this procedure: YES [✓] NO [ ]
- o If no, state reason:
- o Operating Procedure(s) to be used: EOP 2525 and EOP 2526
- o Unit Specific Test Step numbers which will complete this requirement: Step 8.0

Figure 7.1

NORMAL PLANT EVOLUTIONS LIST

5. HOT STANDBY OPERATION

- Will be tested by this procedure: YES [✓] NO [ ]
- If no, state reason:
- Operating Procedure(s) to be used: OP 2526, 2201, 2207
- Unit Specific Test Step numbers which will complete this requirement: 1, 5, 8

6. LOAD CHANGES

- Will be tested by this procedure: YES [✓] NO [ ]
- If no, state reason:
- Operating Procedure(s) to be used: OP 2204
- Unit Specific Test Step numbers which will complete this requirement: Step 4.0

7. PLANT OPERATIONS WITH LESS THAN FULL REACTOR COOLANT FLOW

- Will be tested by this procedure: YES [ ] NO [✓]
- If no, state reason: operation with less than full flow is not allowed by MP2 Tech Specs
- Operating Procedure(s) to be used:
- Unit Specific Test Step numbers which will complete this requirement:

8. PLANT SHUTDOWN

- Will be tested by this procedure: YES [✓] NO [ ]
- If no, state reason:
- Operating Procedure(s) to be used: OP 2204, OP 2205
- Unit Specific Test Step numbers which will complete this requirement: Step 6.0

Figure 7.1

NORMAL PLANT EVOLUTIONS LIST

9. CORE PERFORMANCE TESTING

- o Will be tested by this procedure: YES [ ] NO [X]
- o If no, state reason: core testing was accomplished at its completion.
- o Operating Procedure(s) to be used:
- o Unit Specific Test Step numbers which will complete this requirement:

10. SURVEILLANCE TESTING

- o Will be tested by this procedure: YES [X] NO [ ]
- o If no, state reason:
- o Operating Procedure(s) to be used:
- o Unit Specific Test Step numbers which will complete this requirement:

All require 2600 series SPs were accomplished during this procedure with the exception of (1) 2601A (Borated Water Flow paths and (2) 2602B Transient Temperature Verification.

On 6/18/97 both were accomplished 2602B satisfactory 2601A un satisfactory

SP2601A DR'd 97-2-0052

SUBMITTED BY: William H. [signature]
SOA/Instructor

APPROVED BY: Ronald B. [signature]
ASOT

Figure 7.2

NORMAL OPERATIONS TEST COVER SHEET

UNIT 2 ATTACHMENT NUMBER 8.2

Released for Performance By: [signature] 12/6/93
ASOT DATE

Performed By: Robert W Burnside 4/24/94
DATE

Verified By: ______
DATE

Accepted By: [signature] 5/12/94
ASOT DATE

1. List of Operating Procedure Forms Attached

Plant Heatup OP 2201 Rev 25

2. Comments Attached Yes [ ] No [✓]

STEP	PROCEDURE/RESULTS	ACCEPT/DR
1.0	Plant Heatup	
1.1	Initialize to the following Simulator conditions:	RB

o RCS Temperature at ~ 100° F
o "A" SDC Pump in service maintaining RCS temperatures
o Pressurizer at ~ 95% level, vents closed
o PORV's in "low"
o S/G levels at ~ 60%
o Containment purge via purge supply fan and main exhaust
o Atmospheric dumps in manual and ~ 5% open
o Pressurizer spray valve in manual closed
o RCP bleedoff at 40 psig to EDST

1.2 Use OP2201, "Plant Heatup" ~~and Ops form 2201-1~~ RB ~~and~~ perform a normal plant heatup. Record the following information at the specified times during the heatup: RB

1.2.1 Record the revision level and number of changes against the OP2201 that is used:

Revision level 25 RB

Number of changes ϕ RB

1.2.2 Review each Prerequisite, Initial Condition and Precautions listed in OP 2201 to ensure that the simulator is capable of supporting the use of OP2201. RB

1.2.3 During the heatup, complete (initial) or N/A steps in OP2201~~-1~~ and attach a completed OP2201~~-1~~ to this procedure. RB

Change to using Procedure + attachments

Note: Whenever valve alignments are specified to accomplish the heatup, the valve alignment shall be reviewed for any control board valves or remote functions that need to be manipulated to place them in the proper condition. Valve alignment sheets need not be attached or filled out.

STEP PROCEDURE/RESULTS ACCEPT/DR

1.2.4 Verify that it takes ~ 350 gallons to overf ow the Pressurizer to the Quench Tank after the pressurizer indicates 100% level Record observed number of gallons ~380. — P

1.2.5 Verify that RCS heatup rates are as follows and record the requested data: — P

1.2.5.1 Two RCP's running, heatup rate shall be 20-25°F/hr — P

- o Decay Heat 1 % power
- o Observed heatup rate 26 °F/hr
- o Observed heatup rate was at an average RCS temp of 180 °F

1.2.5.2 Three RCP's running, heatup rate shall be 30-35°F/hr — P

- o Observed heatup rate 32° °F/hr
- o Observed heatup rate was at an average RCS temp of 220 °F

1.2.5.3 Four RCP's running, heatup rate shall be 35-40°F/hr — P

- o Observed heatup rate 41 °F/hr
- o Observed heatup rate was at an average RCS temp of 400 °F

Note: Fast time maybe used during heatup as long as it does not interfere with heatup rate determinations and use of fast time will not interfere with surveillance or other heatup related items.

1.2.6 Pressurizer heatup rate with all heaters on approximately 60°F/hr. Observed pressurizer heatup rate is 60 °F at an average pressurizer water temperature of 200 °F. — P

1.2.7 RCP "Bleedoff flow lo" alarms clear at RCS pressure of ~ 1700 psia. — P

1.2.8 Atmospheric steam dumps maintain an RCS temp of ~532°F. Record atmospheric steam dump pressure that maintains 532°F while in auto. 910 psia. — P

STEP	PROCEDURE/RESULTS		ACCEPT/DR
1.2.9	Perform the follow.ng surveillance procedures prior tc starting the heatup and attach completed surveillance forms to this procedure:		~~PB~~
	o Service Water Valves	SP2612E	RWB
	o RBCCW Valves	SP2611E	RB
	o SRAS Manual	SP2616A	RB
	o CSAS Manual	SP2606F	RWB
	o SIAS Manual	SP2604R	RB
1.2.10	Perform the following surveillance procedures prior to 200°F RCS temperature and attach completed surveillance forms to their procedures.		PB
	o Transient Temp. Verif.	SP2602B	
	o RBCCW Pump Ops - FACI	SP2611A	RWB
	o RBCCW Valves - FACI	SP2611C	PB
	o SW Pump Ops - FACI	SP2612A	RB
	o SW Valves - FACI	SP2612C	PB
	o EBFAS and CR vent FACI	SP2609A-1	PB
	o SIT outlet valve (SIAS)	SP2603A	RWB
	o SIT outlet valve(Pressure)	SP2603B	RB
	o Charg. Pmp. Op.	SP2601G	PB
	o Boric Acid Op.	SP2601C	PB
	o ECCS Valves	SP2604N	PB
	o Borated Water Flow Ops	SP2601A	
	o Ctnt. Isol. Valve Ops	SP2605G	RWB
	o D/G Op FAC I	SP2613A	PB
	o Control Rm Wkly Checks	SP2619C	PB
	o HPSI Pump Op FACI	SP2604A	RWB
	o HPSI Valves FACI	SP2604E	RWB
	o Ctnt. Sump Isol. Vlv-FACI	SP2604G	RWB
	o Control Room Daily Checks	SP2619A	RWB
1.2.11	Perform the following surveillances prior to reaching 300°F RCS temp and attach the completed Surveillance forms:		PB
	o Aux Feed Pump Ops	SP2610A	PB
	o Aux Feed, Turbine Driven Ops	SP2610B	PB
	o Aux Feed Valves	SP2610C	RWB
	o Ctnt Air Recirc Ops-FACI	SP2607A	PB
	o PORV Block Valve Ops	SP2610F	RWB

STEP	PROCEDURE/RESULTS	ACCEPT/DR
1.2.12	Perform the following surveillance prior to reaching 1750 psia RCS pressure and attach the completed surveillance forms:	RB
	o LPSI Pump Ops - FACI SP2604C	RB
	o LPSI Valve Ops - FACI SP2604L	RB
	o Cont. Spray Pmp Ops-FACI SP2606A	RB
	o Cont. Spray Valves - FACI SP2606C	RB
1.2.13	Perform the following surveillance prior to exceeding 5% power and attach the completed surveillance forms:	RB
	o Hydrogen Purge SP2608E	RB
	o PIR Fan FACI SP2608C	RB
	o Turbine Drives Aux Feedpump Ops SP2610B	RB
1.3	Plant heatup is complete when RCS temperature is ~ 532°F, RCS pressure is being maintained at ~ 2260 psia and all surveillances ~~of step 1.2.9, 1.2.10, 1.2.11, 1.2.12 and 1.2.13~~ RB listed to be performed (except MSIV surveillances) are complete.	RB
1.4	Ensure all completed surveillance forms and a completed OPs 2201 ~~-1 form~~ Procedure RB are attached.	RB
1.5	Take a snapshot if required __NA__.	NA

2.0 NUCLEAR STARTUP

2.1	Initial Conditions, Plant stable with RCS Tave at ~ 532° F, ~ 2260 psia, pressurizer level at ~ 40%, S/G levels at ~ 65%, an ECP has been completed, boron in the RCS is at the ECP required boron concentration and CEDM cooling is in operation.	RB

Note: It is the intent of Section 2.0 "Nuclear Startup to be performed from an initial condition that is a continuation of Section 1.0 Plant Heatup or from a snapshot taken from Step 1.5.

STEP	PROCEDURE/RESULTS	ACCEPT/DR
	2.2 Start the "A" CEDM MG Set	[initials]
	2.3 Close all TCB's, Observe load of ~250 amps on C-04 Record Observed value 260 amps.	[initials]
	2.4 Start and parallel the "B" MG set, observe load to be ~ 125 amps each. Record actual values "A" MG set 125 amps and "B" MG set 125 amps.	[initials]
	2.5 Using OP2202, "Reactor Startup", withdraw CEA's to bring the reactor critical. Record the following information at the specified times during the reactor startup:	
	2.5.1 Record the revision level and number of changes against the OP2202 that is used. Revision Level 15 Number of Changes 1	[initials]
	2.5.2 Review each prerequisite, Initial Conditions and Precautions listed in OP2202 to ensure that the simulator is capable of supporting the use of OP2202.	[initials]
	2.5.3 Ensure that OP2202-1 "Pre-Critical Checklist" is completed and attached to this test. Each item on OP2202-2 should be initialized or N/A'd as appropriate.	[initials]
	2.5.4 At ~ 1000 cps, indication shifts from CPS to % power.	[initials]
	2.5.5 Critical Position in observed to be within .9%	[initials]
	2.5.6 Complete and attach forms OP2619D-1 and 2619D-2.	[initials]
	2.5.7 Perform the following surveillance during the startup:	
	o CEA partial movement SP2620A ✓	[initials]
	o CEA Group Deviation Verification ~~SP2620B~~ SP2411 [initials]	[initials]
	o CEA CMI Verification ~~SP2620C~~ SP 2411A [initials]	[initials]
	2.5.8 Stabilize conditions with the reactor critical at ~1% power, Tave at ~532° F. Perform and attach SP2619D-3	[initials]
	2.5.9 Take a snapshot if required NA.	NA

STEP	PROCEDURE/RESULTS	ACCEPT/DR
3.0	**PLANT STARTUP**	
Note:	It is the intent of Section 3.0 Plant Startup to be performed from an initial condition that is a continuation of Section 2.0 Nuclear Startup or from snapshot taken step 2.5.9.	
3.1	Perform a plant startup to ~ 20% power using OP 2203, "Plant Startup" procedure.	
3.1.1	Record the revision level and number of changes against the OP2203 that is used: Revision level 11 Number of Changes 1	RB
3.1.2	Review each prerequisite, Initial Condition and Precaution listed in OP2203 to ensure that the simulator is capable of supporting the use of OP2203.	RB
3.1.3	Ensure the Condensate System is in service on Short Recycle.	B
3.1.4	Start one Circ Water Pump in each condenser.	B
3.1.5	Start the Hydrogen Seal Oil System.	B
3.1.6	Place the Turbine on Turning Gear.	B
3.1.7	Start the Stator Cooling System.	B
3.1.8	Start the EHC System.	RB
3.1.9	Heatup the Main Steam System and open the MSIV's. Perform SP2610E and 2610D attach the forms.	RB
3.1.10	Place Turbine Gland Seal System in service.	RB
3.1.11	Increase reactor power as required to hold RCS Tave at 532° F.	B
3.1.12	Commence drawing a vacuum and observe at 15" hg Steam Dump/Bypass System may be put in service.	B
3.1.13	Observe Turbine Bypass PIC controls RCS T_c at 532°F.	B
3.1.14	Observe at Condenser Vacuum of 20" Hg, a SGFP may be started.	B

STEP	PROCEDURE/RESULTS	ACCEPT/DR
3.1.15	Increase Reactor Power to ~ 7% Tave to 535°F.	DB
3.1.16	Start the Main Turbine per OP2323A	DB
3.1.17	Synchronize and place the main generator on line.	DB
3.1.18	Increase load to ~ 20% power and at 15% power, observe the LPD and Turbine RPS trips are enabled.	DB
3.2	Final conditions are Main Turbine On Line, Reactor Power at ~ 20%, NSST supplying In-House loads	DB
3.3	Take a snapshot if required NA DB	DB

4.0 LOAD CHANGE TO 100% POWER

Note: It is the intent of Section 4.0 "Load Changes to 100% power, to be performed from an initial condition that is a continuation of Section 3.0 Plant Startup or from a snapshot taken in Step 3.3.

STEP	PROCEDURE/RESULTS	ACCEPT/DR
4.1	Perform a power increase from 20% to 100% power using OP2204, "Load Change" procedure.	DB
4.1.1	Record the revision level and number of changes against the OP2204 that is used. Revision level 14 Number of Changes 0	DB
4.1.2	Review each prerequisite, Initial Condition and Precaution listed in OP2204 to ensure the simulator is capable of supporting the use of OP2204.	DB
4.1.3	Verify that Pressurizer Level follows Ops form 2204-3 during the power increase.	DB

Note: Power increase rates used do not need to be restricted, as long as the power increase rate does not cause excessive pressurizer pressure increases, pressurizer level problems, S/G Level Control Problems or T_{ave} Control Problems.

STEP	PROCEDURE/RESULTS	ACCEPT/DR
4.1.4	Perform SP2619E and attach surveillance forms.	DB

STEP	PROCEDURE/RESULTS	ACCEPT/DR
	4.2 Final conditions shall be T_{ave} ~572° F, RCS pressure at ~2260 psia and Generator Load at ~885 MWe.	*B*
5.0	Reactor Trip and Recovery	
	5.1 Initialize to 100% full power IC, normal steady state conditions, perform SP2601D, SP2602A, and attach surveillance forms.	*B*
	5.2 Record the revision level and number of changes against EOP 2525 and EOP 2526.	
	EOP 2525 Rev *12* # of Changes *0*	*B*
	EOP 2526 Rev *9* # of Changes *1*	*B*
	5.3 Manually trip the reactor from C04 TCB P.B. Carryout, EOP 2525, Standard Post Trip Actions.	*B*
	5.4 Verify the Startup Rate is -1/3 DPM ~ one minute after the trip *-1/3 DPM*	*B*
	5.5 Complete EOP 2526, Reactor Trip Recovery, complete and attach OPS Form EOP 2526-1.	*B*
	5.6 Perform a reactor startup and plant startup to ~ 20% full power using OP 2202, OP 2203, and OP 2204 as guides.	*B*
	5.7 Final conditions are: the plant at ~ 20% full power with the Feed Reg. Valves in Auto.	*B*
6.0	PLANT SHUTDOWN	
	6.1 Initialize to a 100% full power IC, normal steady state conditions.	*B*
	6.2 Using OP 2204, decrease load to 20% power.	*B*
	6.3 Using OP 2205, perform a plant shutdown.	*B*
	6.3.1 Record the revision level and number of changes against the OP2205 that is used: Revision Level *10* Number of Changes *Ø*	*B*
	6.3.2 Review each prerequisite, initial condition and precaution listed in OP2205 to ensure the simulator is capable of supporting the use of OP2205.	*B*

STEP	PROCEDURE/RESULTS	ACCEPT/DR
	6.3.3 During the plant shutdown, perform surveillance SP2613B on the "B" D/G, SP2608A H2 Recombiner and attach the completed surveillances.	12/7/93
	6.3.4 Verify that Heater Drain, Condensate and Feedwater Flow decrease as power is decreased.	
	6.3.5 Verify that the RSST assumes the in-house loads when transferred from NSST.	
	6.3.6 Verify the Heater Drains Tank level is ~66% with no HD pumps and the High Level Dump in operation.	
	6.3.7 When the Main Turbine is tripped, verify the CV's, SV's, IV's and ISVS close.	
	6.3.8 Verify the Main Turbine rolls down to turning gear in ~20 minutes.	
	6.3.9 Verify the Turbine Bypass/Steam Dump Valves control RCS T_{ave} to ~532° F and S/G pressure to ~880 psia.	
	6.4 Take a snapshot if required NA.	NA
7.0	REACTOR SHUTDOWN	
	7.1 Obtain Initial Conditions to a Reactor Shutdown using OP2206, by continuing from Section 6.0 or initializing to an IC which is critical Tave ~532° F, RCS pressure ≈ 2260 psia, Reactor Power < 5% with the turbine/generator off line.	
	7.2 Record the revision level and number of changes against the OP2206 that is used: Revision level 8 Number of Changes 0	
	7.3 Review each Prerequisite, Initial Condition and Precaution listed in OP2206 to ensure the simulator is capable of supporting the use of OP2206.	
	7.4 Use OP2206 to shut the reactor down verifying the following:	
	7.4.1 CEA's insert properly in Manual sequential	

STEP	PROCEDURE/RESULTS	ACCEPT/DR
	7.4.2 Reactor Power level decreases at no greater than - 1/3 DPM	B
	7.4.3 Inward CEA motion for an individual CEA stops at the lower electrical limit.	B
	7.4.4 CEA bottom lights go on after TCB's are opened.	B
	7.5 Final Conditions shall be; all CEA's fully inserted, all TCB's open, Both MG sets shutdown, RCS boron concentration at Hot Standby concentration.	B
	7.6 Take a snapshot if required 38.	B
8.0	PLANT COOLDOWN	
	8.1 Reset to an Initial condition with the plant at ~532 RCS T_{ave}, RCS Pressure at ~2260 psia. All CEA's inserted, the Steam Dump Bypass System in service, one condensate pump in service, one SGFP in service and RCS boron concentration sufficient for meeting shutdown margin. Alternatively using the IC at the conclusion of section 7.0 is acceptable.	B
	8.2 Commence a cooldown using OP2207 "Plant Cooldown" verify or record the following during the Plant Cooldown:	B
	8.2.1 Record the revision level and number of changes against the OP2207 that is used:	B
	Revision Level 19 Number of Changes 0	
	8.2.2 Review each Prerequisite, Initial Conditions and Precaution listed in OP2207 to ensure the simulator is capable of supporting the use of OP2207.	B
	8.2.3 Perform SP2614D for AEAS during the cooldown and attach the completed surveillance form.	B
	8.2.4 Verify Pressurizer Pressure and Temperature decrease with all heaters off.	B

STEP	PROCEDURE/RESULTS	ACCEPT/DR
	8.2.5 Verify Pressurizer Pressure and Temperature decrease when Aux Spray is initiated.	RB
	8.2.6 Verify that MSI Block is permitted at < 600 psia S/G Pressure (3 out of 4).	RB
	8.2.7 Verify that SIAS Block is permitted at < 1750 psia RCS pressure (3 out of 4).	RB
	8.2.8 Verify that SDC warmup on 1 LPSI pump is ~12° F/Hr.	RB
	8.3 Final conditions are: RCS temperature <200°F on SDC, i.e. in Mode 5. Pressurizer vents opened and Pressurizer corrected level in at ~50%, Pressurizer temperatures are <200° F, excess ~~letdown~~ Purification RB is in service at ~140gpm and S/G levels are at ~80%.	RB

ATTACHMENT 2

MP2 SURVEILLANCES THAT CAN BE PERFORMED ON THE SIMULATOR

SURVEILLANCE LISTING

UNIT 2

Sequential Number	Title	Procedure #	(Yes/No) To Be Tested
1.	Borated Water Flow/Pump Op	SP2601A	Yes
2.	Boric Acid Ops	SP2601C	Yes
3.	Power Range Calibration	SP2601D	Yes
4.	Charging Pump Ops Fac 1	SP2601G	Yes
5.	Charging Pump Ops Fac 2	SP2601H	No
6.	Reactor Coolant Leakage	SP2602A	Yes
7.	Transient Temp. Verification	SP2602B	Yes
8.	SIT Valve Ops (SIAS)	SP2603A	Yes
9.	SIT Valve Ops (Press)	SP2603B	Yes
10.	HPSI Pump Ops Fac 1	SP2603B	Yes
11.	HPSI Pump Ops Fac 2	SP2604B	No
12.	LPSI Pump Ops Fac 1	SP2604C	Yes
13.	LPSI Pump Ops Fac 2	SP2604D	No
14.	HPSI Valves Ops Fac 1	SP2604E	Yes
15.	HPSI Valves Ops Fac 2	SP2604F	No
16.	Ctmt Sump Valve Fac 1	SP2604G	Yes
17.	Ctmt Sump Valve Fac 2	SP2604H	No
18.	LPSI Valve Ops Fac 1	SP2604L	Yes
19.	LPSI Valve Ops Fac 2	SP2604M	No
20.	ECCS Valve Ops	SP2604N	Yes
21.	SIAS Manual Test	SP2604R	Yes
22.	Ctmt Valve Stroke Time	SP2605G	Yes
23.	Ctmt Purge Valve Power	SP2605G	Yes
24.	Reactor Head & Pzr Vent Sol v1 Oper.	SP2605N	Yes
25.	Ctmt Spray Pump Fac 1	SP2606A	Yes
26.	Ctmt Spray Pump Fac 2	SP2606B	No
27.	Ctmt Spray Valve Ops Fac 1	SP2606C	Yes
28.	Ctmt Spray Valve Ops Fac 2	SP2606D	No
29.	CSAS Manual Test	SP2606F	Yes
30.	CAR Fac 1	SP2607A	Yes
31.	CAR Fac 2	SP2607B	No
32.	H_2 Recombiner	SP268C	Yes
33.	PIR Fan Fac 1	SP2608C	Yes
34.	PIR Fan Fac 2	SP2608D	No
35.	H_2 Purge Ops	SP2608E	Yes
36.	EBFAS Fac 1	SP2609A	Yes
37.	EBFAS Fac 1	SP2609B	No
38.	Motor Driven Aux Feed Pumps	SP2610A	Yes

Approved: —NA—
ASOT

SURVEILLANCE LISTING

UNIT 2

Sequential Number	Title	Procedure #	(Yes/No) To Be Tested
39.	Turb Driven Aux Feed Pump	SP2610B	Yes
40.	Aux Feed Valves	SP2610C	Yes
41.	MSIV Partial Closure	SP2610D	Yes
42.	MSIV Closure	SP2610E	Yes
43.	PORV Block Valve Ops	SP2610F	Yes
44.	RBCCW Pp Fac 1	SP2611A	Yes
45.	RBCCW Pp Fac 2	SP2611B	No
46.	RBCCW Fac 1 Valves	SP2611C	Yes
47.	RBCCW Fac 2 Valves	SP2611D	No
48.	RBCCW Valve Ops	SP2611D	Yes
49.	SW Pp Fac 1	SP2612A	Yes
50.	SW Pp Fac 2	SP2612B	No
51.	Service Water Valves	SP2612C	Yes
52.	Service Water Valves	SP2612D	No
53.	Service Water Valves	SP2612E	Yes
54.	D/G "A" Ops	SP2613A	Yes
55.	D/G "B" Ops	SP2613B	Yes
56.	AEAS Ops	SP2614D	Yes
57.	CSAS Manual Test	SP2616A	Yes
58.	Control Room Shift Checks	SP2619A	Yes
59.	Control Room Weekly Checks	SP2619C	Yes
60.	Start UP Surveillance Checks	SP2619D	Yes
61.	Control Room Monthly Checks	SP2619E	Yes
62.	CEA Partial Movement	SP2620A	Yes
63.	CEA Group Deviation Verification	SP2411	Yes
64.	CMI Verification	SP2411A	Yes

Approved: - NA -

ATTACHMENT 3

MP2 MALFUNCTION TEST ABSTRACTS

1. Loss of Coolant Malfunction Abstracts

SG02 Malfunction - Steam Generator Tube Rupture

This malfunction test was conducted in May, 1997. This malfunction is capable of inserting up to a 3000 gpm tube rupture to either Steam Generator. This malfunction was tested at 100%, 30%, and 5% severity for both Steam Generators. All tests were started from 100% Power, Middle of Life Core Conditions, equilibrium Xenon, steady state Conditions for a period of ~ 12 minutes. Baseline data was from NU Retran model computer runs specific to MP2. No deficiencies were identified.

CV01 Malfunction - Unisolable letdown line rupture in Containment

This malfunction test was conducted in April, 1995. This malfunction is capable of inserting up to a 200 gpm leak from the letdown line (RCS to CVCS) in Containment to the Containment Atmosphere/Floor. This malfunction was tested at 100%, 50% and 10% severity. All tests were started from 100% Power, Middle of Core Life conditions, equilibrium Xenon, steady state Conditions for a period of ~ 8 minutes. Baseline data was from CEN 128 Case E2. No deficiencies were identified.

CV02 Malfunction - Isolable letdown line rupture outside of Containment

This malfunction test was conducted in April, 1995. This malfunction is capable of inserting up to a 200 gpm leak from the letdown line (RCS to CVCS) outside of Containment, in the Auxiliary Building. This malfunction was tested at 100%, 50% and 10% severity. All tests were started from 100% Power, Middle of Life Core conditions, equilibrium Xenon, steady state conditions for a period of ~ 8 minutes. Baseline data was from CEN 128 Case E2. No deficiencies were identified.

CV18 Malfunction - Isolable letdown line rupture inside Containment

This malfunction was conducted in April, 1995. This malfunction is capable of inserting up to a 200 gpm leak from the letdown line (RCS to CVCS) in Containment to the Containment Atmosphere/Floor. This malfunction was tested at 100%, 50% and 10% severity. All tests were started from 100% Power, Middle of Core Life conditions, Equilibrium Xenon, steady state conditions for a period of ~ 8 minutes. Baseline data was from CEN 128 Case E2. No deficiencies were identified.

RC02 Malfunction - RCS Hot Leg Break

This malfunction test was conducted in April, 1995. This malfunction is capable of inserting up to a 180,000 lbm/sec leak from either RCS Hot Leg to Containment. 100% severity is equivalent to a guillotine rupture of a Hot Leg pipe. This malfunction was tested for each Hot Leg at 100%, 50% and 10% severity. All tests were started from 100% Power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions. All tests were for a duration of 5 minutes except the 100% severity case for #1 Hot Leg, which lasted 60 minutes, to observe Containment Sump Recirculation, Containment Sump Level, RWST level, Containment Area Rad Monitor response and Core Exit Thermocouple (CET) response. Baseline data was from the MP2 FSAR, sections 14.15 and 14.16. No deficiencies were identified.

RC03 Malfunction - RCS Cold Leg Break

This malfunction test was conducted in April, 1995. This malfunction is capable of inserting up to a 100,000 lbm/sec leak from any of the four RCS Cold Legs to Containment. 100% severity is equivalent to a guillotine rupture of a Cold Leg pipe. This malfunction was tested at 100%, 50% and 10% severity for all four cold legs. All tests were started from 100% Power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions. All tests were for a duration of 5 minutes. Baseline data was from the MP2 FSAR, sections 14.15 and 14.16. Three deficiencies were identified. They are: (1) Reactor Vessel level dropped to 0% and stayed there. It should eventually have recovered to 7% level due to safety injection. No deficiencies were identified.

RC04 Malfunction - Unisolable Reactor Head Vent Leak

This malfunction test was conducted in May, 1997. This malfunction is capable of inserting up to a 400 gpm unisolable leak through the reactor head vent system. This malfunction was tested at 100%, 50% and 10% severity for a duration of 8 minutes each. All tests were started from 100% Power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions. Baseline was from the CEN 128 Case E2. No deficiencies were identified.

RC05 Malfunction - Pressurizer Safety Valve Failure

This malfunction test was conducted in April, 1995. This malfunction is capable of inserting up to a 250,000 lbm/hr flow from either Pressurizer Safety Valve to the Quench Tank and eventually to the Containment Atmosphere if the Quench Tank Rupture Disc blows. This malfunction was tested at 100%, 50% and 10% severity for each of the two pressurizer safeties for a duration of eight minutes each. All tests were started from 100% Power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions. Baseline data was from an NU Retran analytical case for MP2. No deficiencies were identified.

RC06 Malfunction - Pressurizer Relief Valve (PORV) Failure

This malfunction test was conducted in April, 1995. This malfunction is capable of inserting up to a 130,000 lbm/hr flow from either Pressurizer Relief Valve (PORV) to the Quench Tank and eventually to the Containment Atmosphere if the Quench Tank Rupture Disc blows. This malfunction was tested at 100%, 50% and 10% severity for each of the two pressurizer relief valves (PORV's) for a duration of 13 minutes each. All tests were started from 100% Power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions. Baseline data was from an NU Retran analytical case for MP2. No deficiencies were identified.

Other malfunctions which may be used to give Loss of Coolant conditions are: CV03, CV13, CV14, CV20, CV21, RC20, and SG01. All of these malfunctions give a maximum RCS leak rate of 100 gpm or less. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified.

2. Loss of Instrument Air Malfunction Abstracts

IA01 Malfunction - Instrument Air Header Rupture

This malfunction test was conducted in May, 1996. This malfunction is capable of producing a 5,000 Standard Cubic Feed per minute (SCFm) leak on the instrument air header. This malfunction was tested at 10%, 50%, 85% and 100% severity. The test was started from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions and was ended when a reactor trip occurred and Steam Generator safeties were removing heat. Baseline data was from best estimate analysis and use of plant procedures and P&ID's. No deficiencies were identified.

IA03 Malfunction - Loss of Instrument Air in Containment

This malfunction test was conducted in August, 1990. This malfunction is capable of producing a 300 SCFM leak in the Containment Receiver Tank, thus depressurizing the Containment Air Header. This malfunction was tested at 20% and then ramped up to 100% severity. The test was started from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions and was ended when the Containment low air receiver alarm was received. Baseline data was from best estimate analysis and use of plant procedures and P&ID's. No deficiencies were identified.

It has been identified that this malfunction is not required for either LORT or LOIT training and it will no longer be tested until it is required for training.

Other malfunctions which may be used to provide loss of instrument air conditions are: IA02, IA04 and IA05. The Cause and Effects descriptions may be reference to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified in any of these malfunctions.

3. Loss or Degraded Electrical Power - Malfunction Abstracts

ED05 Malfunction - Loss of 4160 Volt Bus

This malfunction was tested in September, 1990. This malfunction is capable of inserting a loss of any of the 6 4160 Volt Buses due to ground fault. Each of the 6 bus malfunctions This malfunction was tested in April, 1994. This malfunction is capable of inserting a were individually tested starting from 100% power, Middle of Life Core conditions, equilibrium Xenon, steady state conditions. Each test was ended after verifying the loss of power to the correct components and verifying that malfunction removal (ground removal) allowed breakers to be reclosed. Baseline data was from best estimate analysis, use of plant procedure, electrical drawings and P&ID's. No deficiencies were identified.

ED08 Malfunction - 6.9 KV Bus failure to Auto Transfer

This malfunction was tested in April, 1994. This malfunction is capable of inserting a failure for either 6.9 KV bus to auto transfer on a reactor trip. Each of the 2 6.9 KV bus failures to auto transfer were tested. Each malfunction was tested starting from 100% power, Middle of Life Core conditions, equilibrium Xenon, steady state conditions. Each test was ended after verifying correct breaker response, any verifying that manual action to close breakers was still possible. Baseline data was from best estimate analysis, use of plant procedures, electrical drawings, and P&ID's. No deficiencies were identified.

ED10 Malfunction - Loss of 125 VDC Vital Bus

This malfunction was tested in April, 1994. This malfunction is capable of inserting a loss of either 125 volt DC Vital Bus. Each of the 2 malfunctions were individually testing starting at 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions. Each test ended after DC loads were verified to be lost. Baseline data was from best estimate analysis, use of plant procedures, electrical drawings and P&ID's. No deficiencies were identified.

ED16 Malfunction - Loss of Vital 120 Volt Instrument AC

This malfunction was tested in April, 1994. This malfunction is capable of inserting a loss of any of the 4 Vital 120 Volt AC buses. Each of the 4 malfunctions were individually tested starting from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions. Each test was ended after the correct loads were verified to be lost. Baseline data was from best estimate analysis, use of plant procedures, electrical drawings and P&ID's. No deficiencies were identified.

EG08 Malfunction - Diesel Generator Output Breaker Failure

This malfunction was tested in April, 1994. This malfunction is capable of preventing either DG output breaker to fail to close. Each of the 2 malfunctions were tested one at a time from 100% Power both with and without the emergency . s energized, to verify the D/G output breaker would not close. Baseline data was from bes. estimate analysis and electrical drawings. No deficiencies identified.

EG11 Malfunction - Diesel Generator Auto Start Failure

This malfunction was tested in April, 1994. This malfunction is capable of preventing either Diesel Generator from auto-starting following an LNP signal. Each of the 2 malfunctions were tested one at a time from 100% power. Each malfunction was also tested to ensure that a manual Diesel start could be done with the malfunction active. Baseline data was from best estimate analysis and electrical drawings. No deficiencies were found.

Other malfunctions which may be used to provide Loss or Degraded Electrical Power are: ED01, ED02, ED04, ED06, ED07, ED09, ED11, ED13, ED14, ED15, ED17, ED18, EG02, EG07, EG09, EG10 and EG12. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified.

4. Loss of Forced RCS Flow - Malfunction Abstracts

RC11 Malfunction - RCP Locked Rotor

This malfunction test was conducted in May, 1995. This malfunction is capable of inserting a Locked Rotor on any of the 4 RCP's. This malfunction was tested for each of the 4 RCP's starting from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions for a period of 1 minute each. Baseline data is from the MP2 FSAR section 14.6. (One deficiency was identified. RCS temperatures, T_C, T_H, and T_{AVE} did not increase enough on the Simulator and therefore Pressurizer level and pressure did not increase enough on the Simulator. An RPS trip is correctly processed in ~ 1 second on the Simulator as it would in the Reference Plant. This is not a training issue since the reactor promptly trips on low RCS Flow, despite the inadequate RCS temperature and pressure response.)

Other malfunctions which may be used to give Loss of RCS Flow conditions are: CC06, ED04 and RC13. The Cause and Effect descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics.

Yearly Operability Transients 4 and 5 also tests loss of all RCP's and loss of a single RCP. Refer to Attachment 10 for these test abstracts.

5. Loss of Condenser Vacuum/Loss of Condenser Level Malfunction Abstracts

FW01 Malfunction - Loss of Condenser Vacuum

This malfunction test was performed in June, 1994. This malfunction inserts a loss of Condenser vacuum which at 100% severity will cause a Turbine trip in ~ 5 minutes. This malfunction was tested at 10%, 50% and 100% severity. The test was started at 100% Power, equilibrium Xenon, steady state conditions and continued until a Turbine trip occurred. Baseline data was from best estimate analysis and plant procedures. No deficiencies were identified.

6. Loss of Service Water Malfunctions Abstracts

SW05 Malfunction - Unisolable Service Water Header Rupture

This malfunction was tested in May, 1996. At 100% severity, a 5000 gpm leak can be inserted on either Service Water header. This malfunction was tested at 20% and 100% severity for both Service Water headers. All tests were started from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions and ended when service water flow was lost to the major Service Water loads. Baseline data was from best estimate analysis and P&ID's. No deficiencies were identified.

Other malfunctions which may be used to give Loss of Service Water to Service Water headers or individual components are: SW01, SW02, SW03, SW04, SW06, SW07, SW08 and SW09. Cause and Effects descriptions may be referenced to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified in any of these malfunctions.

7. Loss of Shutdown Cooling - Malfunction Abstracts

RH01 Malfunction - Low Pressure Safety Injection (LPSI) Pump Trip

This malfunction test was conducted in May, 1997. This malfunction was started from RCS water level at the minimum level of Centerline of the RCS Hot Leg, with Shutdown Cooling in operation at Beginning of Life conditions with maximum decay heat. The purpose of this test was to verify proper response to loss of Shutdown Cooling at the most limiting conditions. The test was run for a period of 15 minutes. Baseline data was best estimate analysis. No deficiencies were identified.

Other malfunctions which may be used to give Loss of Shutdown Cooling related problems are: RH02, RH03, RH04, RH05 and RH07. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunctions characteristics. No deficiencies were identified in any of these malfunctions.

8. Loss of Component Cooling - Malfunction Abstracts
CC02 Malfunction - RBCCW Header Rupture

This malfunction test was conducted in April, 1997. This malfunction is capable of inserting up to 2000 gpm rupture on either Reactor Building Component Cooling Water (RBCCW) Header. This malfunction was tested at 100%, 50% and 10% severity for each RBCCW Header. All tests were started from 100% power, Middle of Core Life, equilibrium Xenon, steady state conditions. The test was ended when the running RBCCW pump tripped, was isolated and the header restored with the "B" RBCCW pump (if available). Baseline data was from best estimate analysis and P&ID's. No deficiencies were identified.

Other malfunctions which may be used to give a Loss of Component Cooling to headers or components are:

RBCCW (Reactor Building Closed Cooling Water): CC01, CC03, CC04, CC05, CC06, CC07, CC08, CC09 and CC10
TBCCW (Turbine Building Closed Cooling Water): TP01, TP02, TP03, and TP04
Circulating Water to Condenser: CW01, CW02, CW03, CW04, CW06, CW07 and CC08.
The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunctions characteristics. No deficiencies were identified in any of these malfunctions.

9. Loss of Normal Feed/Feed System Failure - Malfunction Abstracts

FW06 Malfunction - Main Feed Pump Trip

This malfunction test was conducted in June, 1994. This malfunction is capable of inserting a trip signal on either Main Steam Generator Feed Pump (SGFP). Both main SGFP trips were tested starting from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions and ending after a reactor trip occurred on Low Steam Generator Level and verification that the tripped main SGFP could be restarted following malfunction removal. Baseline data was from best estimate analysis and P&ID's. No deficiencies were identified.

Other malfunctions which may be used to give Loss of Normal Feed or a normal feed system failure are:
FW23, FW03, FW04, FW05, FW07, FW08, FW09, FW10, FW11, FW13, FW14, FW15, FW16, FW18, FW22, FW28, FW29, MS11, MS13 and MS16.
The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified in any of these malfunctions.

10. Loss of All Feedwater (Normal and Emergency) - Malfunction Abstracts

This event was tested in the Yearly Operability Testing, Transient #2. Refer to Yearly Operability Testing Abstract for Transient #2 in Attachment 10.

11. Loss of Protective System Channel

Malfunctions listed here are those that give complete or partial channel failures of the Reactor Protection System (RPS) or Engineered Safeguards Actuation System (ESAS). Nuclear Instrumentation Failures are listed separately later.

ED16 Malfunction - Loss of Vital 120 Volt Instrument AC Buses

This malfunction was tested in April, 1994. This malfunction is capable of inserting a loss of any of the 4 Vital 120 Volt AC buses. Loss of a single vital 120 V AC bus causes the loss of an RPS channel and loss of an ESAS channel and depending on the malfunction, a loss of an ESAS actuation cabinet. Each of the 4 malfunctions were individually tested starting from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions. Each test was ended after the correct loads were verified to be lost. Baseline data was from best estimate analysis, use of plant procedures, electrical drawings and P&ID's. No deficiencies were identified.

ES04 Malfunction - Loss of Vital 120 Volt Instrument AC to ESAS

This malfunction was tested in May, 1997. This malfunction is capable of tripping the input breakers to each of the 2 ESAS actuation cabinets. Each of the malfunctions were individually tested starting from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions. Each test was ended after the fuses were replaced to show they could be restored by procedure. Baseline data was from best estimate analysis, use of plant procedures, electrical drawings and P&ID's. No deficiencies were identified.

RP12 Malfunction - RPS Safety Channel Cold Leg Temperature Transmitter Failure

This malfunction was tested in May, 1997. This malfunction is capable of failing any of the 8 RCS Cold Leg Temperature transmitters from 465 to 615°F, corresponding to 0 to 100% severity. All 8 malfunctions were tested at 10% severity and then ramped up to 100% severity. Testing was started at 100% power, equilibrium Xenon, steady state conditions. Each test was ended when proper response of the RPS trips which use the malfunctioning Cold Leg Temperature was verified. Baseline data is from best estimate analysis and P&ID's. No deficiencies were identified.

Other malfunctions which may be used to give a loss of Protection System Channel are: RC14, RP01, RP05, RP06, RP07, RP08, RP09, RP10, RP11, RP12, RP13, RP14, RP22, RP24 and RP25. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified.

12. Control Rod Failure - Malfunctions Abstracts

RD01 Malfunction - Dropped Control Rod (CEA)

This malfunction test was performed in May, 1997. This malfunction is capable of dropping any of the 61 Control Rods (CEA's). When a CEA is dropped, it falls from its current position to the bottom of travel. There is no variable severity on this malfunction. Other malfunctions may be used for positioning CEA's at other than full insertion. This malfunction was tested in several stages. First, starting from 100% Power, Beginning of Life conditions, equilibrium Xenon, steady state, CEA's, 14, 15, 16 and 17 were dropped one at a time to verify proper response. These 4 CEA's are each located in a different Core quadrant. All 4 tests were run for 2 minutes a piece without operator intervention, which was sufficient time for RCS Parameters to stabilize, following the CEA drop.

The next portion of the test was to drop CEA #14 starting at 100% power, Middle of Core Life, equilibrium Xenon, steady state conditions and 100% Power End of Life, equilibrium Xenon, steady state conditions to verify the differences between reactivity feedbacks at various times in Core life (BOL vs. MOL vs. EOL). These tests were run for 2 minutes a piece to allow RCS parameters to stabilize without operation intervention.

The next portion of the test was to drop CEA #68, starting from 100% Power, Middle of Core Life, equilibrium Xenon, steady state conditions, remove the malfunction and withdraw the CEA back to pull out position.

The next portion of the test was to drop 1 CEA in each of CEA groups B, 1, 2, 3, 4, 5 and 7 starting from 100% Power, Middle of Core Life, steady state conditions, equilibrium Xenon to verify proper alarm response.

Following the installation of the current core, testing identified that if a S/D group A CEA was dropped (or uncoupled) a reactor trip would result. A DR was prepared (DR 97-2-0032) and to prevent negative training all S/D group 'A' CEAs cannot be dropped or uncoupled.

Baseline data is from Reference Plant dropped CEA events and best estimate analysis. Other than the above discussion on S/D 'A' CEAs no deficiencies were identified.

RD02 Malfunction - Stuck Control Rod (CEA)

This malfunction was tested in May, 1997. This malfunction is capable of making any of the 61 CEA's stick at their current position. All 61 CEA's were tested by starting from 100% Power, Middle of Core Life, equilibrium Xenon, steady state conditions and verifying that a reactor trip did prevent the malfunctioning stuck CEA's from inserting. Baseline data was from Best Estimate analysis. No deficiencies were identified.

RD03 Malfunction - Partial CEA Drop

This malfunction was tested in May, 1997. This malfunction is capable of causing any of the 61 CEA's to drop from 0 to 100 steps below its current position. This malfunction was tested at 10%, 50% and 100% severity for CEA #1 and at 100% severity for all other CEA's. Tests were started from 100% Power, Middle of Core Life conditions, steady state, equilibrium Xenon conditions. Tests were ended when verifying that the individual CEA had dropped, alarm and position indication was correct, and RCS temperature and power had responded to the partial CEA Drop. Baseline data was best estimate analysis. No deficiencies were identified.

RD04 Malfunction - Ejected CEA

This malfunction was tested in May, 1997. This malfunction is capable of causing any of 4 CEA's to be ejected with a resulting 275 gpm RCS leak and reactivity effect dependent on how far the CEA was inserted. All 4 CEA's were individually tested by starting from Middle of Core Life conditions, Hot Zero Power, critical with Group 4 CEA's at 109 steps. The test was run for 5 minutes, allowing sufficient time for Pressurizer level and pressure trends to be established. Baseline data was from FSAR analysis of the Ejected CEA event for reactivity effects and NU Retran analysis to analyze the RCS leak portion of this event. This is not a training issue since we do not train on this event in the Simulator.

RD09 Malfunction - Uncoupled CEA

This malfunction was tested in May, 1997. This malfunction is capable of uncoupling any of the 61 CEA's, from their driveshaft. This malfunction was tested by uncoupling all 61 CEA's starting from 100% Middle of Core Life conditions and verifying that a power (reactivity) drop took place as each CEA was uncoupled. Baseline data was best estimate analysis. No deficiencies were identified.

Following the installation of the current core, testing identified that if a S/D group A CEA was dropped (or uncoupled) a reactor trip would result. A DR was prepared (DR 97-2-0032) and to prevent negative training all S/D group 'A' CEAs cannot be dropped or uncoupled.

Other malfunction which may be used to give Control Rod Failures are: RD05, RD08, RD10 and RD11. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified.

13. Inability to Drive Control Rods (CEA's) Malfunction Abstract

RD06 Malfunction - Switch Failure

This malfunction was tested in April, 1992. This malfunction causes the inability to move any control rods. This malfunction was tested at 100% power, steady state conditions and ended when it was verified that no CEA's could be moved. Baseline data was best estimate. No deficiencies were identified.

14. Fuel Cladding Failure - Malfunction Abstracts

CR01 Malfunction - Fuel Clad Failure

This malfunction was tested in April, 1995. This malfunction is equivalent to a fuel rod gap release from 2% failed fuel at 100% malfunction severity. This malfunction was tested at .1%, 10% and 100% severity. The test was started from 100% power, steady state conditions, Middle of Core Life conditions. The test was ended when radiation monitor response had stabilized. Baseline data was from the FSAR, some reference plant data and some best estimate analysis. No deficiencies were identified.

RC01 Malfunction - RCS Crud Burst

This malfunction was tested in May, 1995. This malfunction at 100% severity gives a full scale indication on the Letdown Radiation Monitor. This malfunction was tested at 20% and 100% severity. The test was started at 100% power, steady state, Middle of Core Life conditions and ended when the Letdown Radiation Monitor reading had stabilized. Baseline data was from the FSAR and best estimate analysis. No deficiencies were identified.

15. Turbine Trip Malfunction Abstracts

TC01 Malfunction - Turbine Trip

This malfunction was tested in April, 1994. This malfunction inserts a turbine trip. It was tested at 100% power, steady state conditions and ended after verification of Reactor and Generator trips. Baseline data was best estimate. No deficiencies were identified.

TC09 Malfunction - Electro Hydraulic Control (EHC) Pump Failure

This malfunction was tested in April, 1994. This malfunction causes either EHC pump to trip. Tripping both EHC pumps eventually causes a Turbine trip. This test was run at 100% power, steady state conditions and ended when the Turbine had tripped due to low EHC pressure. Baseline data was best estimate. No deficiencies were identified.

Other malfunctions which may be used to give a Turbine Trip are:
CW01, FW01, FW33, TP04, TU01, TU03 and TU04. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunctions characteristics. No deficiencies were identified.

16. Generator Trip - Malfunction Abstracts

EG01 Malfunction - Main Generator Trip

This malfunction was tested in April, 1994. This malfunction inserts a Main Generator trip. It was tested starting from 100% power, steady state conditions and ended after verification of a Generator/Turbine and Reactor trip. Baseline data was best estimate. No deficiencies were identified.

ED01 Malfunction - Loss of Normal Station Service Transformer

This malfunction was tested in April, 1994. This malfunction causes a loss of the NSST. It was tested from 100% power, steady state conditions and ended after a Generator trip, Reactor trip and Turbine trip was verified as well as a transfer of power to the RSST. Baseline data was best estimate. No deficiencies were identified.

17. Reactivity/Core Heat Removal Automatic Control System Failures - Malfunction Abstracts

CV09 Malfunction - Inadvertent Dilution

This malfunction was tested in April, 1997. This malfunction inserts up to a 50 gpm dilution into the RCS at 100% severity. The malfunction was tested at 20% and 100% severity starting from 100% power, Middle of Core Life, equilibrium Xenon, steady state conditions and ending after a power increase was noticeable. Baseline data was best estimate analysis. No deficiencies were identified.

Other malfunctions which affect reactivity related Automatic Control Systems are CV10, CV16 and CV19 malfunctions. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified.

FW09 Malfunction - Feed Regulating Valve Position Failure

This malfunction was tested in June, 1994. This malfunction allows either S/G main feed reg valve to be positioned from 0% (full closed) to 100% (full open) depending on 0 100% malfunction severity. This malfunction was tested at 10% and 100% severity on each S/G starting from 100% power, steady state conditions. The test was ended when SG levels were seen to trend properly due to the malfunctioning valves. Baseline data was best estimate analysis. No deficiencies were identified.

Other malfunctions which affect Core heat removal Automatic Control Failures are the FW10, RX10, RX11 and RX12 malfunctions. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified.

Note that loss of or degraded Core heat removal from RCP failures or Shutdown Cooling have been covered previously. Covered here was Core heat removal loss due to loss of Steam Generator Water Inventory Control Systems and reactivity Automated Control Systems.

18. RCS Pressure/Volume Control Systems - Malfunction Abstracts

RX01 Malfunction - Pressurizer Spray Valve Controller Failure

This malfunction was tested in May, 1996. This malfunction simulates an controller failure on either spray valve. 0% to 100% malfunction severity corresponds to valve closed (0%) and valve full open (100%). The malfunction was tested at 0%, 10%, 50% and 100% severity for both spray valves. The malfunction was tested starting from 100% power, steady state conditions and ended when the plant tripped on low RCS Pressure. Baseline data was best estimate analysis. No deficiencies were identified.

Other malfunctions which cause RCS Pressure/Volume Control Systems Failures are RX02, RX03, RX04, RX06, RX07 and RX08. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified.

19. Reactor Trip - Malfunction Abstracts

RP02 Malfunction - Spurious Reactor Trip

This malfunction was tested in May, 1997. This malfunction inserts a momentary, spurious Reactor Trip signal from the manual Reactor Trip System. This malfunction was tested starting from 100% power, steady state conditions and ended when a Reactor Trip was verified to occur. Baseline data was best estimate analysis. No deficiencies were identified.

Other malfunctions which can cause a Reactor Trip to occur are the RP05 and RP25 malfunctions. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified.

20. Main Steam Line and Feed Line Breaks - Malfunction Abstracts

MS01 Malfunction - Main Steam Line Break - Inside Containment

This malfunction was tested in May, 1997. The malfunction is capable of inserting up to a 1.9×10^7 lbm/hr Main Steam Line Break into Containment from either Steam Generator. This malfunction was tested from 100%, 50% and 5% severity for both Steam Generators. All tests were conducted from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions for a period of 8 minutes. Baseline data is from CEN-128 Case A4D. No deficiencies were identified.

MS02 Malfunction - Main Steam Line Break - Outside Containment

This malfunction was tested in April, 1995. This malfunction is similar to MS01 except it is outside Containment. MS02 is capable of inserting up to a 1.9×10^7 lbm/hr Main Steam Line Break outside of Containment from either Steam Generator. This malfunction was tested from 100%, 50% and 5% severity for both Steam Generators. All tests were conducted from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions for a period of 8 minutes. Baseline data is from CEN 128 Case A4D. No deficiencies were identified.

FW25 Malfunction - Feedline Break - Inside Containment

This malfunction was tested in April, 1995. This malfunction is capable of inserting up to a 1.0×10^7 lbm/hr Feedwater Line Break inside Containment for either Steam Generator. This malfunction was tested from 100%, 50% and 10% severity for both Steam Generators. All tests were conducted from 100% power, Middle of Core Life conditions, equilibrium Xenon, steady state conditions for a period of 5 minutes. Baseline data is from CEN 128 Case B5A. No deficiencies were identified.

Other malfunctions which cause Main Steam or Feedwater Leaks are MS03 and FW27. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. No deficiencies were identified.

21. Nuclear Instrumentation (NI) - Malfunction Abstracts

RP17 Malfunction - Wide Range Detector High Voltage Failure

This malfunction was tested in May, 1997. This malfunction causes a loss of High Voltage to any of the 4 Wide Range detectors causing loss of indication. This malfunction was tested for each of the 4 detectors starting from Hot Zero Power, Critical at $10^{-4\%}$ power and ended when all indications were verified to go to the failed position. Baseline data was from best estimate analysis and electrical drawings. No deficiencies were identified.

RP23 Malfunction - Random Noise on Summed NI Power

This malfunction was tested in May, 1997. This malfunction causes a 10% power spike on any of the 4 RPS channels. At 100% severity the spike occurs every ~ 2 minutes. This malfunction was tested at 25% and 100% severity on all 4 channels starting from 100% power, steady state conditions. The test was ended when the spike was verified to occur and indications responded to the spike. Baseline data was from best estimate analysis. No deficiencies were identified.

Other malfunctions which cause Nuclear Instrumentation failures are malfunctions: RP15, RP16, RP18, RP19, RP20 and RP21. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunctions characteristics. No deficiencies were identified.

22. Process Instrumentation, Alarms & Control System Failures - Malfunction Abstracts

CR02 Malfunction - Incore Detector Failure

This malfunction was tested in April, 1995. This malfunction causes any of the 180 Incore detectors to read 0 to 1100 millivolts corresponding to 0% to 100% malfunction severity. This malfunction was tested for all 180 Incore detectors at 10%, 50% and 100% malfunction severity. The test was started at 100% power, Middle of Core Life, steady state conditions and ended when all expected alarms were received. Baseline data is from best estimate analysis. No deficiencies were identified.

Other malfunctions which cause Process Instrumentation, Alarm and Control System Failures are: Malfunctions CR03, CV05, CV06, RM01, RM02, RM03, RX09, RX15, SI02, SI01, CV07, CV11, CV15, CW03, EG02, EG07, EG10, EG12, FW02, FW10, FW12, FW14, FW16, FW28, MS04, MS08, MS13, MS16, RH03, RH07, RX10, RX11, RX12, SW07, SW08, TC02, TC04, TC07 and TP02. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction characteristics. Minor deficiencies were identified and are being corrected with the DR process.

23. Passive Malfunctions in Engineered Safeguards Systems (ESAS) - Malfunction Abstracts

ES03 Malfunction - Engineered Safety Feature (ESAS) Actuation Module - Failure to Actuate

This malfunction was tested in May, 1997. This malfunction causes any of 7 Actuation Modules, to fail to start its components on an accident signal. All testing was started from 100% power, steady state conditions. The test was ended after each of the 7 actuation modules was verified not to start its equipment on the appropriate accident signal. Baseline data was from best estimate analysis and operating procedures. No deficiencies were identified.

ES01 Malfunction - Automatic Auxiliary Feedwater Failure

This malfunction was tested in May, 1997. This malfunction causes either of the 2 channels of Auto Aux Feed not to actuate. Both malfunctions were tested starting from 100% power, tripping the Reactor and allowing Steam Generator levels to go low enough to cause an Auto Aux Feed actuation. The tests were ended when it was verified that Auto Aux Feed did not actuate on that channel. Baseline data was from best estimate analysis and operating procedures. No deficiencies were identified.

Other malfunctions which cause or can cause passive malfunctions in ESAS components are: ES06, CC01, CH01, CV04, CV17, EG09, EG11, FW20, RH06, RH07, SI04 and SW01. The Cause and Effects descriptions may be referred to for each of these malfunctions to describe the malfunction's characteristics. No deficiencies were identified.

24. Failure of Automatic Reactor Trip System (RPS) - Malfunction Abstracts

There are 10 parameters monitored by the Reactor Protection System (RPS) that can cause the reactor to automatically trip. Any 1 or all 10 may be bypassed to fail to cause an automatic Reactor Trip. These bypasses are all remote functions on the MP2 Simulator, not malfunctions. As such, these 10 bypasses are all tested in the Reactor Protection System Test. This testing was performed in April, 1991 and consisted of starting from 100% power, steady state conditions, inserting the auto trip bypass for all 10 RPS monitored parameters and causing conditions that should cause an automatic RPS trip. The test was ended when all 10 parameters had been verified to not initiate an automatic Reactor Trip. No deficiencies were identified.

RP04 Malfunction - Manual Reactor Trip Failure

This malfunction was tested in May, 1997. This malfunction causes any of the 4 manual trip pushbuttons to not work. The automatic RPS trip is unaffected. The malfunction was tested by starting at 100% power, steady state conditions and testing each of the malfunctions to not allow its associated Trip Circuit Breakers to open. Baseline data was from best estimate analysis and electrical drawings. No deficiencies currently exist.

25. Reactor Pressure Control System Failure (BWR's)

Millstone 2 is a PWR, this is not applicable.

Malf Test List For Certification

CC01A-C	RBCCW Pp Trip
CC02A-C	RBCCW Pp Disch Rupture
CC06A-D	Blockage of RBCCW to RCP Cooler
CC11A-C	Degraded RBCCW Pp Capacity
CH01A-D	CAR Fan Trip
CR01	Fuel Clad Failure
CR02101-294	Incore NI Failure
CR031-45	Incore CET Failure
CV01*	L/D Line Rupture in CTMT (unisolable)
CV02*	L/D Line Rupture in Aux Bldg
CV03	L/D Hx Tube Rupture
CV04A-C	Charging Pp Trip
CV06	L/D Pressure Transmitter Failure
CV09	Inadvertent Dilution
CV10	Inadvertent Boration
CV13	Charging Line Leak in CTMT
CV14	Charging Line Leak in Aux Bldg
CV17A,B	BA Pp Trip
CV18*	L/D Line Rupture in CTMT (isolable)
CV19	PMW Batch Counter Failure
CW01A-D	CW Pp Trip
CW02A-D	Traveling Screen D/P (fouling)
CW04A-D	Condenser Tube Rupture (minor)
CW06A-D	Waterbox Fouling
CW08A-D	Condenser Tube Rupture (major)
CW09A-D	Circ Pp Screen D/P Trip Failure
ED01	NSST Loss
ED02	RSST Loss
ED04A,B	25A/B 6.9 KV Bus Loss
ED05A-F	24A-F 4.16 KV Bus Loss
ED06A-F	22A-F 480V Bus Loss
ED07A-P	480V MCC's Loss
ED08A,B	Failure of 25A(25B) to transfer to the RSST following a plant trip
ED09A,B	Loss of VR-11/21
ED10A,B	Loss of 201A,B DC Bus

ED11A-F	Loss of INV-1,2,3,4,5,6
ED13A-D	Loss of DV10,20,30,40
ED14	Loss of Annunciator Power Supply
ED15	Loss of 201D DC Bus
ED16A-D	Loss of VA10,20,30,40
ED17A,B	24C/D Auto Transfer Failure
EG01	Main Gen Trip
EG08A,B	A/B DG Output Bkr Failure
EG09A,B	A/B DG Output Bkr Auto-Close Failure
EG11A,B	A/B DG Auto-Start Failure
EG12A,B	A/B DG Load Control Oscillation
ES01A,B	A/B AAFAS Failure
ES02A,B	CH 1,2 Esas Spurious Actuation
ES03A	AM503 Failure To Actuate
ES03B	AM515 Failure To Actuate
ES03C	AM523 Failure To Actuate
ES03D	AM602 Failure To Actuate
ES03E	AM604 Failure To Actuate
ES03F	AM615 Failure To Actuate
ES03G	AM619 Failure To Actuate
ES03H	AM623 Failure To Actuate
ES04E,F	Actuation Cabinet 5,6 Loss of Power
ES06AA-AD	Z1 Sequencer Failure of Sequence 1,2,3,4
ES06BA-BD	Z2 Sequencer Failure of Sequence 1,2,3,4
FW01	Loss of Condenser Vacuum
FW06A,B	SGFP A,B Trip
FW10A,B	A,B Main FRV Oscillation
FW13A,B	A,B Heater Drains Pp Trip
FW20A,B	MDAFP A,B Trip
FW20C	TDAFP Trip
FW21A,B	AFW Hdr A,B Rupture
FW25A,B*	A,B Mn Feed Hdr Rupture In CTMT
FW30	A AFW Pp Degraded Performance
FW31A/B	Fail Open FRV Bypass
FW32A/B	Failure of SGFP to Trip on Low Vacuum
FW33	Large Vacuum Leak
FW34A/B	Stuck Main FRV
FW35A/B	Stuck Aux FRV
FW36A/B	AFW Leak Upstream FW43A/43B

IA01	Instrument Air Hdr Rupture
IA05	Instrument Air Hdr Rupture In Turb Bldg
MS01A,B*	#1,2 Main Steam Hdr Rupture In CTMT
MS02A,B*	#1,2 Main Steam Hdr Rupture In EB (unisolable)
MS03*	Main Steam Hdr Rupture In Turb Bldg (isolable)
MS06A,B	#1,2 MSIV Spurious Closure
MS07A,B	#1,2 Main Steam Hdr Safety Fails Open
PC01	Loss of PPC
RC01	RCS Crud Burst
RC02A,B*	#1,2 Hot Leg Rupture
RC03A-D*	#1A,B; 2A,B Cold Leg Rupture
RC04*	Rx Vessel Head Vent Leak
RC05A,B*	Pzr Safety Vlv 200/201 Fails Open
RC06A,B*	A,B PORV Fails Open
RC07A-D	RCP A,B,C,D Lower Seal Failure
RC08A-D	RCP A,B,C,D Middle Seal Failure
RC09A-D	RCP A,B,C,D Upper Seal Failure
RC10A-D	RCP A,B,C,D Vapor Seal Failure
RC11A-D*	RCP A,B,C,D Locked Rotor
RC13A-D	RCP A,B,C,D Sheared Shaft
RC20A-D	RCP A,B,C,D Thermal Barrier Tube Rupture
RD0101-69*	Dropped CEA #1-69
RD0201-69	Stuck CEA #1-69
RD0301-69	CEA #1-69 Partial Drop
RD0401,41,62,65*	CEA #1,41,62,65 Ejected
RD06	Failure of "in/hold/out" switch
RD0701-69	CEA #1-69 Reed Switch Position Failure
RD0901-69*	CEA #1-69 Uncoupled
RD10A-I	CEA Grp A,B,1-7 Continous Insertion
RD11A-I	CEA Grp A,B,1-7 Continous Withdrawal
RD12	CMI Failure
RH01A,B*	A,B LPSI Pp Trip
RH02A,B	A,B LPSI Pp Loss of Suction
RH05A,B	A,B SDC Hx Tube Rupture
RH06A,B	A,B CTMT Spray Pp Trip
RH08	A LPSI Pp Degraded Performance
RH09	A CS Pp Degraded Performance
RH10A,B	RWST Suction Check Valve CS-14A,B Failure To Open

RM01A-S	Various Area Radmonitors Failure
RM02A-Q	Various Process Radmonitors Failure
RM03A-G	Various Liquid Effluent Radmonitors Failure
RM04	Waste Gas Decay Tank Rupture
RP01A-P	Noisy Th and Tc Temperature Instruments
RP02	Spurious Rx Trip
RP04A-D	Rx Trip Pushbuttons Failure
RP05A-L	RPS Trip Matrix Power Supply Failure
RP06A-D	A,B,C,D RPS TM/LP Calculator Failure
RP09A-H	RCS Loop Flow Transmitter Failure
RP10A-D	Pzr Pressure Transmitter Failure (safety channel)
RP11A-H	RCS Th Temperature Transmitter Failure
RP12A-H	RCS Tc Temperature Transmitter Failure
RP13A-H	SG #1,2 LevelTransmitter Failure (safety channel)
RP14A-H	SG #1,2 Pressure Transmitter Failure (safety channel)
RP15A-D	CH A,B,C,D Wide Range NI Failure
RP18A-D	Power Range CH A,B,C,D Failure
RP19A-D	Power Range CH A,B,C,D Lower Detector Failure
RP19E,F	Power Range CH X,Y Lower Detector Failure
RP20A-D	Power Range CH A,B,C,D Upper Detector Failure
RP20E,F	Power Range CH X,Y Upper Detector Failure
RP24A-D	CTMT Pressure Transmitter A,B,C,D Failure
RP26A-D	CH A,B,C,D RPS Loss of Power
RX01A,B	Pzr Main Spray Vlv Fails Open
RX03A,B	Pzr Pressure Controller X,Y Failure
RX04A,B	Pzr Level Controller X,Y Failure
RX06A,B	Tavg Program Calculator X,Y Failure
RX07A,B	Th Transmitter Failure (control)
RX08A-D	Tc Transmitter Failure (control)
RX10A-D	SG #1,2 Feed Flow Transmitter Main/Alt. Failure
RX11A-D	MS Hdr #1,2 Steam Flow Transmitter Main/Alt. Failure
RX12A-D	SG #1,2 Level Transmitter Main/Alt. Failure
RX13A,B	ADV #1,2 Fails Open
RX14A-D	SD+BV A-D Fails Open
SG01A,B	SG #1,2 Tube Leak
SG02A,B*	SG #1,2 Tube Rupture
SI02A-D	A,B,C,D SIT Leakage
SI04A-C	A,B,C HPSI Pp Trip
SI05A-C	A,B,C HPSI Pp Degraded Performance

SW01A-C	A,B,C SW Pp Trip
SW02A-C	A,B,C TBCCW Hx Tube Side Flow Blockage
SW03A-C	A,B,C RBCCW Hx Tube Side Flow Blockage
SW04A,B	DG A,B SW Flow Blockage
SW05A,B	A,B SW Hdr Rupture In Turb Bldg
SW09A-C	SW Pp A,B,C Strainer Blockage
SW10	A SW Pp Degraded Performance
SW11A-C	Failure of Switchgear Room Moisture Switch
TC05A-D	Failure of Turbine Stop Valve
TC06A-D	Failure of Turbine Control Valve
WD01A,B	CTMT Sump Disch Vlv SSP-16.1,2 Failure to Open
WD02A,B	CTMT Sump Disch Vlv SSP-16.1,2 Failure to Close

* Those malfunctions annotated with an asterisk are included in the list of Major Malfunctions. Additionally, a composite malfunction consisting of a MSLB in CTMT with an LNP is tested as a Major Malfunction.

Deleted from Rev 1 of Certified List of Malfunctions which can be run for LOIT/LORT

1. RH04A,B — A,B LPSI Pp Seal Failure
2. ES04A-D — A,B,C,D Sensor Cabinet Loss of Power

Added to certified list of malfunctions which can be run for LOIT/LORT

1. ED08A,B — Failure of 25A(25B) to transfer to the RSST following a plant trip
2. FW31A/B — Failure open of FRV Bypass
3. FW32A/B — Failure of SGFP to trip on low vacuum
4. FW33 — Large vacuum leak
5. FW34A/B — Stuck main FRV
6. FW35A/B — Stuck Aux FRV
7. FW36A/B — Aux feed leak upstream of 43A/43B
8. RD06 — Failure of "in/hold/out" switch
9. TC05A-D — Failure of Turbine Stop Valve
10. TC06A-D — Failure of Turbine Control Valve

Developed: [signature] Concurrence: [signature] [signature] See Note 1

SOA Qualified Instr. LORT Coordinator LOIT Coordinator

This list contains all of the malfunctions required to create or support simulator conditions needed to provide training on the Task Training Requirements of the LOIT and LORT programs.

Note 1: Based on current LOIT TPD. [initials]

ATTACHMENT 4

INITIAL CONDITIONS CHECKLIST AND LIST OF 30 CERTIFIED INITIAL CONDITIONS

ATTACHMENT 8.2

MILLSTONE 2

INITIAL CONDITIONS VERIFICATION

CHECKLIST

I. Control Board Walkdown

With the Simulator in "run", at each of the following control boards, an SRO licensed or certified instructor shall review switch positions, controller settings, meter indications, annunciator conditions, system alignments etc. to ensure they are consistent with the intended conditions of the Initial Condition.

C-01 _______	C-01R _______	C-101 _______	C-25A(B) _______
C-02 _______	C-02R _______	RC-05E _____	RC - 14 _______
C-03 _______	C-03R _______	RPS Ch A ____	ESAS Ch A _______
C-04 _______	C-04R _______	RPS Ch B ____	ESAS Ch B _______
C-05 _______	C-05R _______	RPS Ch C ____	ESAS Ch C _______
C-06 _______	C-06R _______	RPS Ch D ____	ESAS Ch D _______
C-07 _______	C-07R _______	C-01X _______	ESAS ActCAB1 ___
C-08 _______	C-08R _______	C-80 _______	ESAS ActCAB2 ___
C-21 ________	SI-652 Wall Switch	_______	RC 100 __________

II. Remote Functions Review

With the Simulator in "run", for each of the following remote function systems, review each remote function to ensure its condition is consistent with the intended conditions of the Initial Condition.

CAR _______	ESR _______	RMR _______	TCR _______
CHR _______	FWR _______	RPR _______	TPR _______
CVR _______	IAR _______	RXR _______	TUR _______
CWR _______	MSR _______	SGR _______	WDR _______
EDR _______	RCR _______	SIR _______	
EGR _______	RHR _______	SWR _______	

III. <u>Initial Condition Stability and Reasonability</u>

Perform either section A, B or C

A. For Equilibrium Xenon, Steady State, Power Levels (50%, 75%, 100%, etc.) only, ensure the following parameters are stable and reasonable for the first 2 minutes after resetting to the IC and going to run:

- o RCS Tc ______
- o RCS Tave ______
- o RCS Press ______
- o S/G Lvl ______
- o DT Power ______
- o NI Power ______
- o CVMWTH ______
- o Elec MWs ______
- o CHG Flow ______
- o L/D Flow ______
- o PZR LVL ______
- o Feed Flow ______
- o Stm Flow ______
- o Xe React Worth (Inst Station) ______
- o CEA Gp 7 posit reasonable for pwr lvl ______
- o ASI reasonable and consistent with power lvl and CEA posit __

* Perform SP 2601D (when appropriate) to ensure consistency

o Using Xenon Fastime X60, and holding thermal power and CEA position constant, ensure that total xenon reactivity does not change by more than 20 pcm in 4 minutes of Xenon Fastime X60.

o Using Xenon Fastime X60, and holding thermal power and CEA position constant verify that ASI does not change by more than .03 from its initial value (if> 50% power) or greater than .05 from its initial value (if <50% power) during a 4 minute period of Xenon Fastime X60. This can be done in parallel with the previous step.

o Ensure any items mentioned in IC description on instructor station are correct and any key items not present on the instructor station IC description are added. Key items in remarks section of IC are BOL/MOL/EOL, Xenon Trend, load limit pot setting, unusual CEA positions, unusual equipment lineups, etc.

B. For ICs which have the reactor critical, but do not fall into category A above, verify the following parameters are stable and/or reasonable for the first 2 minutes after resetting to the IC and going to run:

- o RCS Tc _______
- o RCS Tave _______
- o RCS Press _______
- o S/G Lvl _______
- o DT Pwr _______
- o NI Pwr _______
- o CVMWTH _______
- o Electric Power___
- o CHG Flow ______
- o L/D Flow _____
- o PZR Lvl ______
- o Feed Flow ______
- o Stm Flow ______
- o Xe react worth ______ (inst station)
- o CEA Gp 7 posit ______ reasonable for pwr lvl
- o ASI reasonable and consistent with pwr lvl and CEA position _____

- o Using Xenon Fastime X60 for 4 minutes, and holding thermal power and CEA position constant, observe that the change in Xenon reactivity worth and ASI are consistent with the stated IC's conditions and will not cause unreasonable conditions to occur for the operator.

- o Ensure any items mentioned in IC description on instructor station are correct and any key items not present on the instructor station IC description are added. Key items in the remarks section of the IC are BOL/MOL/EOL, Xenon Trend, load limit pot setting, unusual CEA position, unusual equipment lineups, etc.

C. For ICs which the reactor is not critical and may be in various stages of Plant Startup or Shutdown, verify the following parameters are stable and/or reasonable for the first 2 minutes after resetting to the IC and going to run:

- o RCS Tc ______
- o RCS Tave ___
- o RCS Press ___
- o S/G Lvl _____
- o W/R Pwr _____
- o PZR Lvl _____
- o Feed Flow _____
- o Xe React Worth ____ (inst Station)
- o CHG Flow ______
- o If on SDC flow/temp is steady ______
- o If H/U or C/D in progress,# RCP's correct _____

- o Using Xenon Fastime X60 for 4 minutes, observe that the change in Xenon reactivity worth is consistent with the stated conditions of the IC description.

- o Ensure any items mentioned in the IC description on the instructor station are correct and any key items not present on the instructor station IC description are added. Key items in the remarks section of the IC are BOL/MOL/EOL, Xenon trend, time after reactor trip, unusual CEA positions, unusual equipment lineups, etc.

IV. IC Requirements to be Specifically Verified

Verify the following:

Remote Functions

CCR03 set to 50°F (to fail B HXTCV open)
CVR03 set to open
CVR13 set to closed
CWR01 set to 55°F
FWR55 set to stet gpm (at-power ICs)
FWR55 set to 0 gpm (shutdown ICs)
IAR17 set to lead
IAR15 set to start
MSR03 set to auto
MSR05 set to auto
MSR07 set to auto
RPR31 set to full
SGR01 set to 9.4
SGR02 set to 38.0
SWR04 set to open
SWR05 set to closed
SWR06 set to closed
SWR07 set to closed
SWR12 set to 0%
SWR24 set to 0%
TPR16 set to close
TPR18 set to TBCCW
WDR06 set to open
WDR02 set to auto

PPC Points

SCBLDN1 consistent with SGR01
SCBLDN2 consistent with SGR01

Initial Conditions						
IC NO	RCS TAVG	PZR PRESS	RX PWR	BORON CONC	XE REACT	REMARKS
1 **						On SDC, ready to draw bubble
2 **						On SDC, ≈40% in pzr, ready to start RCPs
3	532	2267	0	1382	-1	Initial Rx S/U after refueling ECP GP 7 @ 90 Steps
4	532	2263	0	1383	-1	BOL, Rx S/U with S/D A and S/D B out, ECP GP 7 @ 90 Steps
5	533	2269	1	1382	-1	BOL, AFW to both S/G, Turbine at 0 rpm
6	538	2270	10	1381	-18	BOL, 'A' SGFP to both S/G, Turbine at 1800 rpm
7	540	2265	19	1377	-31	BOL, ready to transfer load to NSST
8	551	2265	40	1358	-91	BOL, ready to start 2nd condensate pump
9	554	2265	49	1345	-118	BOL, ready to start 2nd SGFP
10	572	2265	100	1016	-2313	BOL, 100% Eq xe
11	535	2265	0	434	-1	EOL, Rx S/U S/D A and B out, Reg GP 1 thru 4 out, ECP GP7 @ 90 steps
12	572	2265	100	20	-2632	EOL, 100% Eq xe
13	532	2260	0	1000	-2389	EOL, Rx SD, OP 2207 step 4.1 ≈24 hr after S/D
14	252	370	0	-2000	-2686	EOL, warm-up of SDC system prior to initiation
15 **						EOL, on SDC, Pzr level @ 40% ready to drain down

Initial Conditions						
IC NO	RCS TAVG	PZR PRESS	RX PWR	BORON CONC	XE REACT	REMARKS
16	88	13	0	2000	-1	EOL, on SDC draining down, at top of Hot Leg
17	87	14	0	2000	-1	EOL, on SDC at centerline of Hot Leg
18 **						EOL, comming off line at 10% per hour
19	534	2265	0	952	-1	MOL, Rx S/U SD A and B out, Reg group 1 thru 4 out, ECP Gp 7 @ 90 steps
20	534	2265	0	567	-3567	MOL, ≈4 Hr post trip (Xe inc)
21	534	2265	0	567	-3514	MOL, ≈12 Hr post trip (Xe dec)
22	569	2265	89	583	-2444	MOL preparing for turbine valve test
23	541	2265	0	567	-2914	MOL, RCS in stable N/C AFW to both S/G
24	572	2265	100	567	-2424	MOL, 100% Eq xe
*25	532	2265	0	1125	-5	Conditions which will exist for plant S/U @ 5895 MWD/MTU
*26	572	2272	100	721	-2423	5895 MWD/MTU, 100%, Eq xe
*27	545	2255	28	1004	-75	MOL, ≈30% pwr - Stability
*28	552	2255	48	978	-154	MOL, ≈50% pwr - Stability
*29	571	2270	96	571	-2432	MOL, ≈96% pwr - Stability

* Not certified - not for training use.

** Currently under development.

ATTACHMENT 5

STUDENT FEEDBACK SURVEY RESULTS

To: File

From: W.H. Souder, III
MP2 Simulator Operations Assistant

Subject: Student Feedback

Attachment: 1) Memo W.H. Souder dated 10/16/96
2) NSEM 6.01 form 7.01

1. Twice in the past seven months I have requested student feedback on the simulator.

* In October 1996, A memo (Att. 1) was sent to all MP2 License Holders asking for input in identifying areas in which the simulator model was in error (or could be improved).

≈ 20% of the operators responded and the greatest percentage of comments concerned the modeling of various cooling systems (RBCCW, TBCCW, CW and SW). DRs were generated and work will begin on these model improvements.

DR	96-2-0050	CW System
DR	96-2-0051	RBCCW System
DR	96-2-0052	TBCCW System
DR	96-2-0053	SW System

* In April/May 1997 student feedback was requested using nsem 6.01 form 7.01 from four of the six shifts in training during that time.

≈ 25% responded and has provided useful input in identifying differences between the simulator and the plant.

Items mentioned included:

** Annunciator response for door alarms (C.01X) is incorrect. (DR-96-2-0021)

** Inability of the STA to use the SM SPDS terminal to select safety functions or EOPs. Corrected.

** Use of metal trays for computer keyboards/IDT terminals. Corrected

** Inability of the operators to put alarms in alarm defeat on the simulator. Currently being evaluated.

** Too much room exists on the US desk, there in an additional PC on this desk which is used throughout the shift. A PC was installed on the desk 5/30/97.

** The alignment of the AFW reset switches on C-05 alignment (position) is not correct. Corrected.

2. Both methods of request have worked well for me. I plan on using both in the future:

* The memo to all license holders will be sent out annually.

* I will personally request input from two of the training shifts each training cycle.

draft\nsem\sfb.ws1

Attachment 1

16 Oct 1996

To: ALL MP2 License Holders

From: Bill Souder, MP2 Simulator Operations Assistant

Subject: MP2 Simulator Modeling

1. Over the past few months, much has been said about the accuracy of the MP2 Simulator in modeling the response of the plant during both normal and accident situations.

2. Since you operate the plant and know how it responds better than me, I am asking for your help in identifying areas that the simulator modeling could be improved.

3. Please complete the attached form and return to me via inter-office mail by 10/24/19.

   When completing the form:

   * Ensure that your name is on this form. This is necessary if I need to ask any additional information to ensure that I understand exactly what

   * Make any comments as detailed as necessary. This again will ensure that I understand what you are saying. So that I can understand what you are saying.

4. At the completion of this data gathering, I will provide a summation of all problems which have been identified.

Name ______________________________ Date ________

MP2 Simulator Modeling Questionnaire

Simulator systems which are modeled: RBCCW, CVCS, Electrical Distribution/Generation, Feed/Condensate, Instrument Air, Main Steam, RCS, SDC, Rad Monitors, RPS, Reactor Reg, S/G, Safety Injection, SW, Turbine, TBCCW and Waste Disposal

1. How closely does the MP2 Simulator model the response of the plant?

____

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2. List any areas in these system which you feel could be modeled differently to improve the overall training.

____

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Use additional paper to answer either question

Attachment 2

FORM 7.1

To: All _____ Simulator Users
Unit

From: _________________________.
Simulator Operations Assistant

Subject: Accuracy of _______ Simulator
Unit

If you have noticed issues concerning the accuracy of the _____ simulator please complete the appropriate sections of this form. Unit

We are interested in knowing of any deficiencies you may have observed between the simulator and the actual control room/control boards. This form should be used to address fidelity issues only. Do not use this form to address training topics or issues.

Please return the completed form to either the instructor or the unit SOA. Please include your name in the space provided if you wish to have a written response forwarded to you regarding the comments you have provided.

If you have and questions please contact the unit SOA at EXT ________.

Comments Submitted by: _______________________ DATE: ___________

FORM 7.1

Instructions

For the following areas of simulator fidelity please indicate the problem you observed including the following information:

- The simulator's condition/response (what evolutions were in progress and what the simulator did or did not do)
- The condition or response you expected
- Any special plant conditions needed to reproduce the condition or response including any temporary ICs that may have been produced to capture the condition
- Any plant procedures in use including step numbers significant to the problem and
- Any applicable reference sources (if known and applicable) to assist in the problem investigation

The more specific information you can provide to the Simulator Computer Engineering group the faster we can resolve the problems you have identified.

FORM 7.1

SIMULATOR FIDELITY

FEEDBACK

A. PANELS, INDICATION AND CONTROLS

1. Use this area to report observed differences between the plant and the simulator regarding panels, meters, switches, lights, scales, ranges, locations, etc.

2. Use this area to report any observed difference between the plant and the simulator regarding mimic, back shading, name tags, labels, etc.

B. COMMUNICATION EQUIPMENT

1. Use this area to report any observed differences between the plant and the simulator regarding the communications devices available.

C. ENVIRONMENT

1. Use this space to report any observed differences between the plant and the simulator regarding the amount and type of normal and/or emergency lighting.

2. Use this space to report and observed differences between the plant and the simulator regarding the amount, type and arrangement of furniture or incidental equipment (timers, print racks, calculators, etc.).

D. PLANT COMPUTER

1. Use this space to report any observed differences between the plant and the simulator regarding the PPC input and output devices (CRTs, keyboards, printers, etc.).

2. Use this space to report any observed differences between the plant and the simulator regarding the PPC functions, capabilities and responses.

E. SIMULATOR RESPONSE

1. Use this space to report any simulator response that you believe to be incorrect or questionable.

2. Use this space to report any procedure section, step or operation you were unable to perform because of limitations of the simulator.

ATTACHMENT 6

OPEN DEFICIENCY REPORT (DR) LIST

MP2 SIMULATOR OPEN DR STATUS - ASSOCIATED WITH CERTIFICATION

DR #	DESCRIPTION	WHEN SCHEDULED
95-2-0044	MS14, MS15 and MS16 response	12/97
95-2-0042	MS11A affects suspect	12/97
97-2-0032	SD "A" CEA worth (or modeling)	7/97
97-2-0033	Incore temperatures inaccurate	7/97
97-2-0040	RM01B and RM01E response (no inst fall light when fail)	8/97
97-2-0041	RD03 response (incomplete annunciator actuation)	7/97
97-2-0043	EG07 response (no visible effect on generation)	12/97
97-2-0044	RH05 response (no increase in RBCCW activity)	10/97
97-2-0046	RD04 response (leak flow much greater than 275 gpm) (Reactivity effect questionable) (RCS pressure response questionable)	12/97
97-2-0047	RP22 response (not all RPS trip units actuated by actuation of PTT)	12/97
97-2-0049	PC01 response	8/97
97-2-0050	RM02A response	8/97
97-2-0051	RM02P response	8/97

ATTACHMENT 7

SCHEDULE FOR NEXT FOUR YEARS OF TESTING

ATTACHMENT 8.2

MP2

PERFORMANCE TEST

SCHEDULE

	START	END
Performance Test (4 Year Cycle):	July 1997	June 2001
Year One:	July 1997	June 1998
Year Two:	July 1998	June 1999
Year Three:	July 1999	June 2000
Year Four:	July 2000	June 2001

APPROVED BY: ______________________
ASOT

YEAR ONE

TEST	SCHEDULING WORK AREA
Annual Operability NSEM-4.09	
28% Steady State Accuracy	
50% Steady State Accuracy	
100% Steady State Accuracy	
100% Stability	
Transient #1: Manual Reactor Trip	
Transient #2: Simultaneous Trip of All Feedwater Pumps	
Transient #3: Simultaneous Closure of All Main Steam Isolation Valves	
Transient #4: Simultaneous Trip of All Reactor Coolant Pumps	
Transient #5: Trip of the "A" Reactor Coolant Pump	
Transient #6: Main Turbine Trip From Power Level Not Resulting in Immediate Reactor Trip	
Transient #7: Rapid Ramp Rate Decrease in Plant Power	
Transient #8: Maximum LOCA with LNP	

TEST	SCHEDULING WORK AREA
Transient #9: Maximum Unisolable MSLB Inside Containment	
Transient #10: Slow RCS Depressurization to Saturated Conditions Using "A" PORV Stuck Full Open (1 HPSI Defeated)	
Physical Fidelity Verification (NSEM-4.12) Note: SHM requires approximately 2 months advance notice to schedule photographer for photo book update.	
Instructor Station Test - (NSEM-4.11)	
Major Malfunction Tests NSEM-4.04	
RD09XX Uncoupled CEA	
RC11A (B,C,D) RCP Locked Rotor	
Minor Malfunctions NSEM-4.05 (Listed by System)	
Electrical Distribution - ED	
Reactor Protection System - RP	
Electrical Generation - EG	
Condensate/Feedwater - FW	
Turbine Controls - TC	
TBCCW - TP	
Plant Computer - PC	

YEAR TWO

TEST	SCHEDULING WORK AREA
Annual Operability NSEM-4.09	
28% Steady State Accuracy	
50% Steady State Accuracy	
100% Steady State Accuracy	
100% Stability	
Transient #1: Manual Reactor Trip	
Transient #2: Simultaneous Trip of All Feedwater Pumps	
Transient #3: Simultaneous Closure of All Main Steam Isolation Valves	
Transient #4: Simultaneous Trip of All Reactor Coolant Pumps	
Transient #5: Trip of the "A" Reactor Coolant Pump	
Transient #6: Main Turbine Trip From Power Level Not Resulting in Immediate Reactor Trip	
Transient #7: Rapid Ramp Rate Decrease in Plant Power	
Transient #8: Maximum LOCA with LNP	
Transient #9: Maximum Unisolable MSLB Inside Containment	

TEST	SCHEDULING WORK AREA
Transient #10: Slow RCS Depressurization to Saturated Conditions Using "A" PORV Stuck Full Open (1 HPSI Defeated)	
Physical Fidelity Verification (NSEM-4.12) Note: SHM requires approximately 2 months advance notice to schedule photographer for photo book update.	
Normal Plant Evolutions NSEM-4.10	
Plant Startup	
Nuclear Startup	
Turbine Startup and Generator Synchronization	
Reactor Trip and Recovery	
Hot Standby Operation	
Load Changes	
Plant Shutdown	
Surveillance Testing Note: Individual surveillance tests are performed during normal operations.	

YEAR TWO

TEST	SCHEDULING WORK AREA
Major Malfunction Tests NSEM-4.04	
RC05A(B) RCS SV Failure	
RC06A(B) PORV Failure	
MS01A(B) MSLB in CTMT	
RD01XX Dropped CEA	
RC02A(B) T_H LOCA	
RD04XX Ejected CEA	
RC03A(B,C,D) T_C LOCA	
MS02A(B) MSLB out CTMT	
Minor Malfunctions NSEM-4.05 (Listed by System)	
Main Steam - MS	
Reactor Coolant System - RC	
Core - CR	
Shutdown Cooling - RH	
Control Rods - RD	
Steam Generators - SG	

YEAR THREE

TEST	SCHEDULING WORK AREA
Annual Operability NSEM-4.09	
28% Steady State Accuracy	
50% Steady State Accuracy	
100% Steady State Accuracy	
100% Stability	
Transient #1: Manual Reactor Trip	
Transient #2: Simultaneous Trip of All Feedwater Pumps	
Transient #3: Simultaneous Closure of All Main Steam Isolation Valves	
Transient #4: Simultaneous Trip of All Reactor Coolant Pumps	
Transient #5: Trip of the "A" Reactor Coolant Pump	
Transient #6: Main Turbine Trip From Power Level Not Resulting in Immediate Reactor Trip	
Transient #7: Rapid Ramp Rate Decrease in Plant Power	
Transient #8: Maximum LOCA with LNP	
Transient #9: Maximum Unisolable MSLB Inside Containment	

TEST	SCHEDULING WORK AREA
Transient #10: Slow RCS Depressurization to Saturated Conditions Using "A" PORV Stuck Full Open (1 HPSI Defeated)	
Real Time Test - MP2 (NSEM-4.13)	
Physical Fidelity Verification (NSEM-4.12) Note: SHM requires approximately 2 months advance notice to schedule photographer for photo book update.	
Major Malfunction Tests NSEM-4.04	
FW25A (B) FW Line Break in Ctmt	
CV01A LD Line Leak in Ctmt.	
CV02A LD Line Leak in Aux Bldg.	
CV18A LD Line Leak in Ctmt. (Isolable)	
Minor Malfunctions NSEM-4.05 (Listed by System)	
CTMT/Heating/Vent. - CH	
Instrument/Station Air - IR	
Reactor Regulating System - RX	
Waste Disposal - WD	
Service Water - SW	
Turbine - TU	

YEAR FOUR

TEST	SCHEDULING WORK AREA
Annual Operability NSEM-4.09	
28% Steady State Accuracy	
50% Steady State Accuracy	
100% Steady State Accuracy	
100% Stability	
Transient #1: Manual Reactor Trip	
Transient #2: Simultaneous Trip of All Feedwater Pumps	
Transient #3: Simultaneous Closure of All Main Steam Isolation Valves	
Transient #4: Simultaneous Trip of All Reactor Coolant Pumps	
Transient #5: Trip of the "A" Reactor Coolant Pump	
Transient #6: Main Turbine Trip From Power Level Not Resulting in Immediate Reactor Trip	
Transient #7: Rapid Ramp Rate Decrease in Plant Power	
Transient #8: Maximum LOCA with LNP	
Transient #9: Maximum Unisolable MSLB Inside Containment	

TEST	SCHEDULING WORK AREA
Transient #10: Slow RCS Depressurization to Saturated Conditions Using "A" PORV Stuck Full Open (1 HPSI Defeated)	
Physical Fidelity Verification (NSEM-4.12) Note: SHM requires approximately 2 months advance notice to schedule photographer for photo book update.	
Major Malfunction Tests NSEM-4.04	
MSO3 MSLB in Turb. Bldg	
MSLB W/LNP Composite	
RC04 RCS Leak	
RH01A (B) LPSI Pp Trip (Loss of SDC)	
SG02A (B) SGTR	
Minor Malfunctions NSEM-4.04 (Listed by System)	
RBCCW - CC	
CVCS - CV	
Circulating Water - CW	
Engineered Safeguards - ES	
Radiation Monitoring - RM	
Safety Injection - SI	

MARGINAL NOTE DIRECTORY
ATTACHMENT 8.2

1. Deleted the requirement to perform approximately 25% of all system test on an annual basis. System testing has proven to produce very few discrepancies and has be n deleted.

ATTACHMENT 8

ANNUAL OPERABILITY TRANSIENT TESTING ABSTRACTS

YEARLY OPERABILITY TRANSIENT TESTING ABSTRACTS

The following 10 transients were all run in April/May, 1996. All parameters discussed below were recorded at a .5 second time interval as required by ANSI/ANS 3.5 (1985) Appendix B. No exceptions to ANSI/ANS 3.5 (1985) are taken.

Transient #1 - Manual Reactor Trip

As required by ANSI/ANS 3.5 (1985) Appendix B, a manual reactor trip was performed from 100% power, steady state (Middle of Life conditions), equilibrium Xenon. All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.2.2.1 were recorded for a period of 2 minutes, which is sufficient time for RCS temperature to stabilize and Pressurizer pressure, level and Steam Generator level to ramp towards recovery. Baseline data for comparison is from a April 16, 1987 reference plant Turbine Trip. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.1. All acceptance criteria were met, no deficiencies were identified.

Transient #2 - Simultaneous Trip of all Feedwater Pumps

As required by ANSI/ANS 3.5 (1985) Appendix B, a simultaneous trip of all Feedwater pumps were performed from 100% power, steady state (Middle of Life conditions), equilibrium Xenon. No Main or Auxiliary feed was allowed to the Steam Generators. All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.2.2.1 were recorded for a period of 4 minutes, which is sufficient time for RCS temperature to stabilize and Pressurizer pressure and level to ramp towards recovery. Baseline data for comparison is from CEN 128 Case b.4. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.1. All acceptance criteria were met, no deficiencies were identified.

Transient #3 - Simultaneous Closure of All Main Steam Isolation Valves (MSIV's)

As required by ANSI/ANS 3.5 (1985) Appendix B, a simultaneous closure of all MSIV's was performed from 100% power, steady state (Middle of Life conditions), equilibrium Xenon. To be consistent with analytical data to be used for comparison, Atmospheric Steam Dumps were not allowed to open, Pressurizer PORV's were blocked closed and a loss of all feed occurred at the same time. All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.2.2.1 were recorded for a period of 1 minute, which is sufficient time for RCS temperature to stabilize due to the Steam Generator Safety Valves and Pressurizer Pressure and Level to bottom out and start recovery. Baseline data for comparison is from a FSAR Case, Section 14.9, Figures 14.9-1, 2, 3 and 4 and some best estimate analysis. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.1. All acceptance criteria were met, no deficiencies were identified.

Transient #4 - Simultaneous Trip of all Reactor Coolant Pumps (RCP's)

As required by ANSI/ANS 3.5 (1985) Appendix b, a simultaneous trip of all RCP's was performed from 100% power, steady state (Middle of Life conditions) equilibrium Xenon. All four RCP's and 3 Condensate Pumps were lost by a electrical fault/on both 6.9 KV buses. All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.2.2.1 were recorded for a period of 5 minutes, which is sufficient time for RCS Tave to be controlled on the Condenser Dump Valves.

Baseline data for comparison is from an NU generated RETRAN run for MP2, which is a best estimate run for a loss of 4 RCP's at 100% power. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.1. All acceptance criteria were met, no deficiencies were identified.

Transient #5 - Trip of any Single Reactor Coolant Pump (RCP)

As required by ANSI/ANS 3.5 (1985) Appendix B, a trip of a single RCP (the "A" RCP) was performed from 100% power, steady state (Middle of Life conditions), equilibrium Xenon. All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.2.2.2 were recorded for a period of 4 minutes, which is sufficient time for RCS temperature to stabilize and Pressurizer level and pressure to ramp towards recovery. Baseline data for comparison is from CEN 128 Case C.1. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.2. All acceptance criteria were met, no deficiencies were identified.

Transient #6 - Main Turbine Trip from Power Level not resulting in immediate Reactor Trip.

As required by ANSI/ANS 3.5 (1985) Appendix B, a Main Turbine Trip from ≈15% power was performed. 15% power is the highest Reactor power that will not cause an immediate Reactor Trip from a Turbine Trip. All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.2.2.1 were recorded for a period of 2 minutes, which is sufficient time for RCS temperature to stabilize and Pressurizer pressure, level and Steam Generator level to ramp towards recovery. Baseline data for comparison is from best estimate analysis. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.1. All acceptance criteria were met, no deficiencies were identified.

Transient #7 - Rapid Ramp Rate Decrease in Plant Power from 100% to 75% power.

As required by ANSI/ANS 3.5 (1985) Appendix B, a rapid ramp rate decrease in plant power from 100% power to 75% power was performed from 100% power steady state (Middle of Life conditions), equilibrium Xenon. All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.2.2.1 were recorded for a period of 10 minutes, which is sufficient to reduce power to < 75% power by use of boric acid addition to the RCS and use of the Throttle Pressure Limiter for the Turbine Control valves. Baseline data for comparison is from best estimate analysis. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.1. All acceptance criteria were met, no deficiencies were identified.

Transient #8 - Maximum Size Reactor Coolant System Rupture combined with loss of all offsite power.

As required by ANSI/ANS 3.5 (1985) Appendix B, a maximum size Reactor Coolant System Rupture with a complete loss of offsite power was performed from 100% power, steady state (Middle of Life conditions), equilibrium Xenon. This was done by causing the equivalent of a double ended Hot Leg pipe guillotine rupture coincident with a complete loss of all offsite power, such that only the Emergency Diesel Generator Buses and battery power were available.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.2.2.3 were recorded for a period of 5 minutes, which is sufficient time for Containment Temperature and Pressure to peak. Baseline data for comparison is from FSAR Section 14.15 and 14.16; figures 14.5-11 and Figures 14.16-6 & 7. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.3.

Following the original transient #8, it was identified that both CTMT pressure and temperature response was unsat. This response was identified as unacceptable, work was done on the simulator model and the transient was run again. The results of this run were, all acceptance criteria were met, no deficiencies were identified.

Transient #9 - Maximum Unisolable Main Steam Line Rupture

As required by ANSI/ANS 3.5 (1985) Appendix B, a maximum size unisolable main Steam Line Rupture was performed from 100% power, steady state (Middle of Life Conditions), equilibrium Xenon. This was done by causing the equivalent of a double ended Main Steam Line pipe guillotine rupture in Containment. All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.2.2.3 were recorded for a period of 7 minutes, which is sufficient time for Pressurizer Pressure and Level to begin recovery and Containment Temperature and Pressure to have peaked. baseline data for comparison is from CEN 128 Case A4A, CEN 268 Case 5.3 and some Best Estimate Analysis. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.3.

Following the original transient #8, it was identified that both CTMT pressure and temperature response was unsat. This response was identified as unacceptable, work was done on the simulator model and the transient was run again. The results of this run were, all acceptance criteria were met, no deficiencies were identified.

Transient #10 - Slow Primary System Depressurization to Saturated Condition using Pressurizer Relief Valve Stuck Open (HPSI inhibited).

As required by ANSI/ANS 3.5 (1985) Appendix B, a PORV was stuck fully open and the RCS was allowed to depressurize with all High Pressure Safety Injection Disabled. This event was initiated from 100% power, steady state (Middle of Life conditions), equilibrium Xenon. All parameters, listed in ANSI/ANS 3.5 91985) Appendix B.2.2.4 were recorded for a period of 11 minutes which was sufficient time to allow the RCS to reach saturation. With regard to Appendix B.2.2.4, relief valve flow was not available for recording and Reactor Vessel Level and Saturation Margin were available but were recorded at 5 second intervals versus .5 second intervals. baseline data for comparison is from a NU RETRAN analytical case specific to Millstone 2, CEN 268, Case 5.1.2, and some Best Estimate analysis. Graphical comparisons were made for each of the monitored parameters from Appendix B.2.2.4 (except relief valve flow). All acceptance criteria were met, no deficiencies were identified.

ATTACHMENT 9

PHYSICAL FIDELITY SUMMARY REPORT

FORM 7.1

EXCEPTIONS - CONTROL ROOM LAYOUT

UNIT: 2

1. During the 1994 refueling outage, the physical appearance of the real control room was changed. An STA office was added, the Shift Managers office was enlarged, the PPO/SPO/US desks were separated then relocated. Many of the storage locations for both procedures, prints, etc. were changed. The size of the simulator room will not allow all these changes to be made.

   The following is a listing of the major differences between the real control room and the simulator together with a statement as to any effect on training.

   - The Shift Managers office is not modeled. (no effect on training)
   - The STAs office is not modeled. (no effect on training)
   - In the real control room, there are many more procedures (Chemistry, Health Physics, I&C, Maintenance, etc.) which are frequently referenced during daily operation. During typical simulator training, these procedures are not necessary so are not stored and maintained on the simulator. (no effect on training)
   - In the real control room, the phone system has been replaced with a newer and more modern system. It is the desire of the MP2 OPS MGR that differences be minimized. An SDC has been generated to replace the simulator phone system.
   - In the real control room, the operating procedures are stored in a different type of filing cabinet. On the simulator the location of these cabinets are also different. (no impact on training)

2. The emergency plan communications consoles (radio pager), Tech Support Center (TSC) Phone, Waterford Police Phone, Operational Support Center (OSC) Phone, Berlin Phone, Emergency Operations Facility (EOF) Phone and NRC red phone are not present on the Simulator. Push buttons are provided on the simulator control room desk phone console for EOF and NRC. Since all communications from the operators would be to a limited number of simulator instructors in the instructor booth anyway, there is no significant training impact on whether they communicate thru the phone console at the Simulator Operator Desk versus the real EOF and NRC phones in the reference plant control room. The simulator is not used to provide training on the radiopager. This is not a licensed operator task. When E-Plan drills are run on the simulator, additional phones are installed to allow the Shift Manager, On Site Duty Officer and other drill participants a chance to deal with other members of the Station Emergency Response Organization (SERO).

Completed by: [signature] Date: 6/17/97

Reviewed by: [signature] Date: 6/17/97
ASOT

FORM 7.1

EXCEPTIONS - CONTROL ROOM LAYOUT

UNIT: 2

3. In the real control room, there are three (3) laser jet printers. Two are used to print alarms and periodic reports while the third is used to print when requested by various control room personnel computers (SM, US, STA and PPO/SPO).

   The first two are modeled on the simulator while the third is not.

4. The location and size of the key locker is different between the real control room and the simulator. The number of keys required to operate the simulator is quite small when compared to the real plant. To improve realism, the simulator is using the same index and key numbering system as the plant. (no effect on training)

5. The chairs located in the real control room are of a slightly different design and color as those on the simulator. (no effect on training)

6. The P&ID table in the real control room has 1/4" thick sheet of plexiglass used to protect the various drawing indexes. Laminated drawing indexes are available on the simulator. (no effect on training)

7. On the simulator, Fire Protection Panel (C26) is not modeled. In the real control room, this panel provides alarm indication only and all subsequent actions are taken in the plant. No control room training can be received with this panel. (no effect on training)

Completed by: [signature] Date: 6/17/97

Reviewed by: [signature] Date: 6/17/97
ASOT

FORM 7.2

EXCEPTIONS - PANEL LAYOUT

UNIT: 2

1. C-08 in reference plant has Electrical Protection Relaying, Simulator does not, except for Main Generator 86/87 relay resets. This has no significant training impact.

2. C-04 Rear, C-03 Rear and C-02 Rear in reference plant has bistables, simulator does not. The bistables serve no direct operator control purpose and therefore have no training impact.

3. Recorders FR 150, 160, 170 and 180 on C-05 Rear in the reference plant are not simulated. These recorders display RCP Parameters for trend purposes. These RCP points are available on the simulator, as in the reference plant, on C-04 Rear. The only thing lost is long term trending by not having these recorders, but simulator sessions would not last long enough to make the recorders of use to the operators in the simulator. There is no training impact.

4. TI 6897 on C-01 Rear in reference plant not simulated. Lack of Reactor Vessel Support Leg temperatures in Containment has no significant impact on training.

5. The reference plant has an oscillograph next to RC-14, the simulator does not. The operators do not use the oscillograph for any control or monitoring function, therefore there is no training impact.

6. On C-05R, the reference plant has an "EDAN Flow Monitor" which consists of a switch and fuse, the simulator does not. Operators are not trained on this switch. There is no training impact.

7. On C-05R, the reference plant has the CEAPDS computer above the CEAPDS I/O chassis, at the simulator these are reversed. These units are not manipulated by the operators, therefore there is not training impact.

8. In the real control room, modifications to the ESAS sensor and actuation cabinets were accomplished in 1992. Many of these hardware changes were installed on the simulator in an effort to maintain fidelity. The completion of the SDC was put "on-hold" due to the potential of replacing the sensor and actuation cabinets. There are currently minor differences in appearance between the real control room and the simulator. This has minimal training impact.

Completed by: William H. Sage Date: 6/17/97

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FORM 7.3

EXCEPTIONS - COMPONENTS

UNIT: 2

1. The recorders listed below are GMAC recorders in the reference plant but in the simulator are TRACOR recorders made to appear similar to GMAC recorders since they have a clear cover. This was done because GMAC recorders are practically unattainable. The GMAC reference plant recorders have pointers which point up, the simulator Tracor recorders have pointers which point down. Scales and chart paper are identical. Recorders affected are:

C-02	RR202	C-04	FRC210X
C-05	PR4215		FRC210Y
	LR5282		JR011
C-06/7	TR7030		JR009
	UR4501		

The below listed recorders are YOKOGAWA recorders in the plant but are currently TRACOR on the simulator. (These are scheduled to be replaced on the simulator)

C-05	UR5265	C-04	UR7660
			TR 111
			TR 121

Having different recorder produces no adverse training impact.

2. Recorders RJR 9129, 9373 and AJR 7837 on RC-14 are different in reference plant versus simulator. Difference is different model of Leeds and Northrup recorder. The plant recorders have print wheels, the simulator recorders have thermal paper. There is no training impact.

3. On reference plant panel C-02, controllers PIC 201, TIC 223 and PIC 215 have a green stripe over the setpoint band, the simulator does not have the green stripe. The green stripe has no special meaning, therefore there is no training impact.

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FORM 7.3

EXCEPTIONS - COMPONENTS

UNIT: 2

4. On Control Panel C-04 at the reference plant, the backup scanner digital CEA position indicator and selector switches are slightly different than the simulator. The actual digital display numbers have a different degree of "sharpness" versus the reference plant. The selector switches are thumbwheel type on the simulator versus dials in the reference plant. They are functionally identical and therefore there is no training impact.

5. On Control Panel C-05, the "B" Condensate Pump Ammeter is different between the simulator and reference plant. The difference is slight, and since there is no opportunity for an operator to misread the scale there is no training impact.

6. The reference plant control panel C-21, "Hot Shutdown Panel", located in West 480 Volt Switchgear room, has several meters which are "SIGMA" meters, where as the Simulator C-21 panel, located in a connecting room off the simulator has G-E style meters. The meters are the same size and scale. These meters are TI-115, TI-125, PI103, PI103-1, LI 110X and LI 110Y. There is no training impact since the information obtained from the meters is identical.

7. There are some holes in the reference plant C-21 panel but not in the simulator C-21 panel. This has no training impact.

8. On reference plant control panel C-06/7, the EHC Insert has the "G-E" nameplate, the simulator does not. This has no training impact.

9. On reference plant control panel RC-14, recorders RR8123A/B and RR 8262 A/B are Esterline Angus recorders, on simulator they are TRACOR recorders. The recorder scales and chart paper are otherwise identical. The make of the recorder has no training impact.

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FORM 7.3

EXCEPTIONS - COMPONENTS

UNIT: 2

10. The reference plant has 22 "SIGMA" style meters on C-03 and C-05, but the simulator has "G-E" style meters. Same ranges on simulator and reference plant, just different style meter. Affected meters are:

    C-03: PI-103, PI-103-1, TI-112CA, TI-112CC, TI-122CA, TI-122CC, TI-112HA, TI-112HB, TI-112HC, TI-112HD, TI-122HA, TI-122HB, TI-122HC, TI-122HD, TI-111Y, TI-121Y, TI-112CB, TI-112CD, TI-122CB, TI-122CD C-05: LI-5271 , LI-5273. There is no training impact since the information obtained from the meters is identical.

11. The reference plant has calibration stickers on various meters, controllers, etc.; the simulator does not. Calibration stickers have no impact to training.

12. The 2-SI-652 manual disconnect switch in the reference plant is a different style than in the simulator. The switch positions are the same. There is no impact to training.

13. On Control Panel C-03 at the reference plant, the meters for RCS pressure and TM LP setpoint Channels A, B, C, and D have both pointers colored red. At the simulator the RCS pressure meter has a red pointer and the TMLP setpoint pointer is colored yellow. These meters are PI-102A, PI-102B, PI-102C and PI-102D.

    There is no training impact due to this difference in pointer colors.

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FORM 7.4

EXCEPTIONS - AMBIENT ENVIRONMENT

UNIT: 2

1. In the reference plant there is a steady background noise of Control Room Air Conditioning (CRAC). Also when changing CRAC equipment in the reference plant there is a change in background noise. At the simulator, there is no CRAC background noise and therefore no audio cue of deliberate or non-deliberate changes to CRAC. There is no significant training impact.

2. In the reference plant, a page may be performed by dialing at the operator's desk phone, in the simulator a pushbutton is used for paging at the operator's desk phone. This has no training impact.

3. There is no radiopager, NRC, Waterford Police, Operational Support Center (OSC), Berlin, EOF and TSC phones on the simulator. This is discussed on Form 7.1, item #2. This causes no significant training impact.

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ATTACHMENT 8.2
MARGINAL NOTE DIRECTORY

1997

SIMULATOR PHYSICAL FIDELITY
REPORT CHANGES

1. This Physical Fidelity report is a modification of the report submitted in June 1993. It is current with respect to the simulator and the control room.

ATTACHMENT 10

SAMPLE MALFUNCTION TEST PROCEDURES

STEP#	PROCEDURE/RESULT	PANEL	TAG #	ACCEPT/DR
12.0	RC04: Unisolable RCS leak on the Rx vessel head vent. Range: 0-100%, 100% = 400 gpm at 2250 psid. Establish a Trend Group (RC04) which contains the following points and will trend for 8 minutes: PZR Pressure P102B1 PZR Lever L110X CTMT temperature T8096 CTMT pressure P8113 CTMT sump level L9155 PPC points to be verified: none			
12.1	Reset simulator to 100%.			
12.2	Insert mal RC04 at 100% severity to actuate at 2 seconds then start the recording program.			
12.3	Place simulator in run.			
12.4	When RC04 actuates, verify:			
12.4.1	Pzr level decreases which cause: * L/D flow to be reduced * Both first and second back up charging pumps to start. * CTMT sump level to rise	PPC	F212	bthS

STEP#	PROCEDURE/RESULT	PANEL	TAG #	ACCEPT/DR
12.4.2	With maximum charging and minimum L/D, Pzr level will continue to lower at approximately 5%/min.	PPC	L110X	GHS
12.4.3	Pzr pressure will decrease and TM/LP trip will occur in approximately 6 minutes.			GHS
12.4.4	VCT level decreases.			
12.4.5	RCS leak rate program shows approximately 400 gpm leak.	PPC		GHS
12.4.6	CTMT conditions indicate RCS leakage:			
	* CTMT normal sump	PPC	L9155	
	* CTMT temperatures	PPC	T8096	
	* CTMT pressure	PPC	P8117	
	* CTMT gas/particulate RAD monitors (will not show any radiation effects for approximately 10 minutes)	PPC	R8123A R8123B	
12.4.7	The following alarms will actuate when their setpoints are exceeded:			
	* Pzr Press deviation	CO2/3	D37	
	* Pzr level X(Y) Hi/low	CO2/3	A38(39)	
	* SIAS Actuation CH1(2)	CO1	A(B)34	GHS
12.5	After the recording program stops, place simulator in freeze.			
	Exit Data recording program.			

STEP#	PROCEDURE/RESULT	PANEL	TAG #	ACCEPT/DR
	Plot the transient as follows: * On any Xterm window, type: mp2plot_rco4, then Hit return * On that CRT, the "WINGZ" program will come up. Select All when prompted * In approximately 5 minutes the plots will be available in the SCE office.			
12.6	Reset the simulator to 100%, then reset the leak rate program.			
12.7	Insert RC04 at 50% severity, parameter recording is not required. Run transient for 4 minutes.			
12.8	When RC04 actuates, verify:			
12.8.1	RCS leak rate approximately 200 gpm. * Actual leak rate 247 gpm	PPC		[illegible]
12.8.2	RCS pressure decreases but TM\LP trip does not occur. * Minimum RCS pressure 2204 psia	PPC	P102B1	[illegible]
12.8.3	Pressurizer level decreases at approximately 1% per minute. * Minimum Pzr level 54.1 %			[illegible]
12.8.4	RCS pressure will be maintained above 2200 psia by pzr heaters.			
12.9	Reset simulator to 100%, then reset the RCS leakrate.			

STEP#	PROCEDURE/RESULT	PANEL	TAG #	ACCEPT/DR
12.10	Insert RC04 at 10% severity, parameter recording is not required. Run transient for approximately 4 minutes			
12.11	At completion of 4 minute run, verify			
12.11.1	RCS leak rate approximately 40 gpm. * Actual leak rate 41 gpm	PPC		[signature]
12.11.2	RCS pressure maintained 2225 psia-2275 psia. * Minimum RCS pressure 2262 psia	PPC	P102B1	[signature]
12.11.3	Pressurizer level maintained by cycling of first back up CHG pump. * Minimum pressurizer level 63.5 % note - B/U CHG pump did not cycle on [signature]	PPC	L110X	[signature]
12.12	End of RC04 Test.			

Performed by: [signature] Date: 4/7/97

Rev.: 2
Date: 3/12/97

CC11A (B and C) *RBCCW Pump Degraded Performance*
Variable

STEP#	PROCEDURE/RESULT	PANEL	TAG #	ACCEPT/DR
1.0	Reset to 100% power.	PCM		GotS
2.0	Start or verify running the 'A' RBCCW pump.			GotS
	Actual pressure 118 psig	PPC	P6008	
	Actual flow 6062 GPM	PPC	F6035	GotS
3.0	Insert malfunction CC11A at a 20% severity and observe discharge pressure and flow decrease:	PCM	CC11	GotS
	Pressure ~ 108 psig	PPC	P6008	
	Flow ~ 5600 GPM	PPC	F6035	GotS
	Actual pressure 108 psig	PPC	P6008	
	Actual flow 5602 GPM	PPC	F6035	GotS
4.0	Increase severity to 40% and observe:			GotS
	Pressure ~ 96 psig			
	Flow ~ 5075 GPM			
	Actual pressure 97 psig	PPC	P6008	
	Actual flow 5074 GPM	PPC	F6035	GotS

STEP#	PROCEDURE/RESULT	PANEL	TAG #	ACCEPT/DR
5.0	Increase severity to 100% and observe:			WHS
	Pressure ~ 60.8 psig Flow ~ 2660 GPM			
	Actual pressure 61 psig	PPC	P6008	
	Actual flow 2661 GPM	PPC	F6035	WHS
6.0	Remove malfunction CC11 and observe 'A' RBCCW pump parameters return to normal.			WHS
	Pressure and flow as indicated in step 2.0			
7.0	Reset to 100% power and complete the remaining CC11 malfunctions on the remaining RBCCW pumps. The effects will be similar to those seen in CC11A with the following exceptions:			
	CC11B affects the "B" RBCCW pump		C11B	
		PPC	P6009	
		PPC	F6035	
	CC11C affects the 'C' RBCCW pump		CC11C	
		PPC	P6010	
		PPC	F6034	WHS
8.0	End of CC 11 test.			

Performed by: William H. Sxxx Date: 4/3/97

ATTACHMENT 11

LIST OF CERTIFIED REMOTE FUNCTIONS

FIGURE 7.1

CERTIFIED REMOTE FUNCTIONS LIST

UNIT 2 PAGE 1 OF 10

CCR01	RBCCW SURGE TK FILL BYPASS 2-RB-53
CCR02	TIC-6308 HX-18A TO TV-6308,6380A(DEGF)
CCR03	TIC-6307 HX-18B TO TV-6307,6307A(DEGF)
CCR04	TIC-6306 HX-18C TO TV-6306,6306A(DEGF)
CCR05	RBCCW SURGE TK DRAINS 2-RB-54A/54B
CCR06	ISOL VLV 2-RB-3A DOWNSTREAM P-11A(%)
CCR07	ISOL VLV 2-RB-3A DOWNSTREAM P-11B(%)
CCR08	ISOL VLV 2-RB-3C DOWNSTREAM P-11C(%)
CCR10	THROTTLE SFP CLG FLOW VLV 2-RB-8B(%)
CCR11	THROTTLE SFP CLG FLOW VLV 2-RB-8A(%)
CCR12	SFP HEAT LOAD (E6BTU/HR)
CCR13	SFP PUMP A START
CCR14	SFP PUMP B START
CCR15	SFP HX-20A VLV 2-RW-6A
CCR16	SFP HX-20B VLV 2-RW-6B
CCR17	EVAP HEAT LOAD (ON/OFF)
CCR18	2-RB-66 SURGE TANK MAKEUP ISOLATION VALVE
CCR31	HPSI PUMP B HDR SEAL COOLING SUPPLY
CCR32	R-RB-14A SD HX A OUTLET(%)
CCR33	R-RB-14B SD HX B OUTLET(%)
CCR34	CC PMP B BREAKER STATUS
CCR35	RBCCW PMP A RAD&RECIRC ISOL 2RB43&107A
CCR36	RBCCW PMP B RAD&RECIRC ISOL 2RB41&107B
CCR37	RBCCW PMP C RAD&RECIRC ISOL 2RB39&107C
CCR38	RBCCW PMP A BREAKER
CCR39	RBCCW PMP C BREAKER
CHR01	OUTSIDE AIR TEMPERATURE VARIATION(DEGF)
CHR02	H2 PURGE AIR SOURCE 2-IA-27.2
CHRC.	CNTMT PURGE VALVES LOCK OUT(AC-4,5,6&7)
CHR05	RESET CHILLERS 169A/B,196A/B,170
CVR01	CHG PMPS OUTLET TO HPSI 2-CH-440,340
CVR02	LETDOWN FLOWPATH THRU DEBORATION IX
CVR03	BORIC ACID PUMP DISCHARGE VALVES (2-CH-152/153)
CVR05	B.A. FROM BATCH TK TO TK 8A 2-CH-124
CVR06	B.A. FROM BATCH TK TO TK 8B 2-CH-135
CVR07	VCT LETDOWN ISL 2-CH-397
CVR08	CHARGING PUMP, P-18A, RACKOUT
CVR09	CHARGING PUMP, P-18B, RACKOUT
CVR10	CHARGING PUMP, P-18C, RACKOUT
CVR11	CHARGING PUMP, P-18B, KIRK KEY
CVR12	CHARG PUMP P-18A DIS HDR ISOL (2-CH-338)
CVR13	VCT TO WASTEGAS HEADER (2-CH-102)
CVR14	BORIC ACID MAKEUP ISOLATION (2-CH-172)
CVR15	2-CH-201P ISOLATION VALVE 2-CH-350
CVR16	2-CH-201Q ISOLATION VALVE 2-CH-349
CVR17	LPSI HDR TO CVCS PURIF LINE 2-CH-603

[signature] 6/17/97

ASOT Signature/Date

CVR18	PURIF LINE TO LPSI SUCTION 2-CH-024
CVR20	2-CH-110P ISOLATION VALVE 2-CH-342
CVR21	2-CH110Q ISOLATION VALVE 2-CH-344
CVR22	PMW TRANSFER PUMP P-22B
CVR23	PMW TRANSFER PUMP P-22A
CVR24	2-CH-210Y BORIC ACID MAKEUP VLV LEAKAGE
CVR25	B.A. TANKS SUCTION CROSS-TIE 2-CH-144
CVR26	B.A. TANK 8A TO BA PUMP SUCTION 2-CH-131
CVR27	B.A. TANK 8B TO BA PUMP SUCTION 2-CH-142
CVR28	DEAERATOR WATER TRANSFER PUMP
CVR29	BORIC ACID TANK 8A CONC CHANGE (% WT)
CVR30	BORIC ACID TANK 8B CONC CHANGE (% WT)
CVR31	N2 TO VCT 2-CH-109
CVR32	H2 TO VCT 2-CH-107
CVR33	PURIF IX OUTLET 2-CH-378
CVR34	CHARGING PUMP A SUCTION VALVE 2-CH-316
CVR35	CHARGING PUMP B SUCTION VALVE 2-CH-319
CVR36	CHARGING PUMP C SUCTION VALVE 2-CH-322
CVR37	PMW STOP VALVE 2-CH-195
CVR38	BA GRAVITY FEED ISOLATION 2-CH-130 (TANK A)
CVR39	BA GRAVITY FEED ISOLATION 2-CH-140 (TANK B)
CWR01	SEA WATER TEMPERATURE(DEG F)
CWR02	WATER BOX A PRIME & VENT 2-VP-1A,14A
CWR03	WATER BOX B PRIME & VENT 2-VP-1B,14B
CWR04	WATER BOX C PRIME & VENT 2-VP-1C,14C
CWR05	WATER BOX D PRIME & VENT 2-VP-1D,14D
CWR06	SCREENWASH PUMP P-8A
CWR07	SCREENWASH PUMP P-8B
CWR08	CIR WATER PUMP A BREAKER
CWR09	CIR WATER PUMP C BREAKER
CWR10	CIR WATER PUMP B BREAKER
CWR11	CIR WATER PUMP D BREAKER
EDR01	DISCONNECT SWITCH (15G-22S1-4)
EDR02	BKR A505 IN TEST & INTERLOCKS DEFEATED
EDR03	NSST LOCKOUT DEVICE
EDR04	RSST LOCKOUT DEVICE
EDR05	STATIC TRANSFER SWITCH VS1
EDR06	STATIC TRANSFER SWITCH VS2
EDR07	STATIC TRANSFER SWITCH VS3
EDR08	STATIC TRANSFER SWITCH VS4
EDR09	IAC 1(VR11) THROW OVER SWITCH(RS1)
EDR10	IAC 2(VR21) THROW OVER SWITCH(RS2)
EDR11	DISCHARGE RATE FOR BATT DB1(X NORMAL)
EDR12	DISCHARGE RATE FOR BATT DB2(X NORMAL)
EDR13	DISCHARGE RATE FOR BATT DB3(X NORMAL)
EDR14	SUPPLY BREAKER FOR 24E FROM 24C (A305)
EDR15	SUPPLY BREAKER FOR 24E FROM 24D (A408)
EDR16	BATT CHGR 201A AC/DC BKRS
EDR17	BATT CHGR 201B AC/DC BKRS
EDR18	BATT CHGR 201C AC/DC BKRS

EDR19	D.C. BREAKER (D0103) CONTROL
EDR20	D.C. BREAKER (D0104) CONTROL
EDR21	D.C. BREAKER (D0204) CONTROL
EDR22	D.C. BREAKER (D0203) CONTROL
EDR23	345 KV SWITCH BREAKERS CONTROL
EDR24	GRID VOLTAGE VARIANCE (KV)
EDR25	GRID FREQUENCY VARIANCE (HZ)
EDR26	MOTOR OVERCURRENT RELAY RESET
EDR27	6.9 KV NSST(H101) BREAKER RI/RO
EDR28	6.9 KV NSST(H286) BREAKER RI/RO
EDR29	6.9 KV RSST(H103) BREAKER RI/RO
EDR30	6.9 KV RSST(H204) BREAKER RI/RO
EDR31	ENERGIZE VR11 FROM (B32) MCC-2C
EDR32	ENERGIZE VR21 FROM (B41A) MCC-1DA
EDR33	ALL BREAKERS ON 25A (6.9 KV)
EDR34	ALL BREAKERS ON 25B (6.9 KV)
EDR35	ALL BREAKERS ON 24A (4.16 KV)
EDR36	ALL BREAKERS ON 24B (4.16 KV)
EDR37	ALL BREAKERS ON 24C (4.16 KV)
EDR38	ALL BREAKERS ON 24D (4.16 KV)
EDR39	ALL BREAKERS ON 24E (4.16 KV)
EDR40	NSST TO 24A (A102) BREAKER RI/RO
EDR41	NSST TO 24B (A206) BREAKER RI/RO
EDR42	480V TO 22A (A103) BREAKER RI/RO
EDR43	480V TO 22C (A104) BREAKER RI/RO
EDR44	480V TO 22B (A204) BREAKER RI/RO
EDR45	480V TO 22D (A205) BREAKER RI/RO
EDR46	24E TO 24F (A505) BREAKER RI/RO
EDR47	UNIT 1 TO 24E (A602) BREAKER RI/RO
EDR48	RSST TO 24D (A411) BREAKER RI/RO
EDR49	RSST TO 24C (A302) BREAKER RI/RO
EDR50	480V TO 22E (A303) BREAKER RI/RO
EDR51	480V TO 22F (A409) BREAKER RI/RO
EDR52	24C TO 24A (A304) BREAKER RI/RO
EDR53	24D TO 24B (A410) BREAKER RI/RO
EDR54	24G TO 24C/D (A702) BREAKER RI/RO
EDR55	PPC POWER
EDR56	APPENDIX R INTERLOCK DEFECT SWITCH
EDR57	UNIT 1 BREAKER (A602) CONTROL
EDR58	UNIT 1 RSST TO 14H (A603) CONTROL
EDR59	UNIT 1 LOAD THRU A601 (AMP)
EDR60	14H/14C,D (A601) CONTROL
EDR61	UNIT 1 NSST/DG POWER
EDR62	UNIT 1 RSST POWER
EGR01	MOTOR OPERATED DISCONN SWITCH(15G-2X1-4)
EGR02	EMERG SEAL OIL PUMP (RI/RO)
EGR05	MAIN GEN BREAKER 8T OPERATION SELECTED
EGR06	MAIN GEN BREAKER 9T OPERATION SELECTED
EGR07	DG 12U MECHANICAL RESET SWITCH
EGR08	DG 13U MECHANICAL RESET SWITCH

EGR09	EMERG SO PUMP TEST (H-33,H-34)
EGR10	MAIN GEN BKR 8T/9T GETAC CONTROL
EGR11	MAIN GEN LOCKOUT (86GCD1,86GCD2)
EGR12	DIESEL GEN A STARTING AIR ISOLATION
EGR13	DIESEL GEN B STARTING AIR ISOLATION
EGR14	DIESEL GEN A MANUAL TRIP
EGR15	DIESEL GEN B MANUAL TRIP
EGR16	DIESEL GEN A/B TROUBLE/ACKNOWLEDGE
EGR17	DIESEL GEN A BREAKER (A312) RI/RO
EGR18	DIESEL GEN B BREAKER (A401) RI/RO
EGR19	F-38A LOCAL CONTROL
EGR20	F-38B LOCAL CONTROL
ESR01	8A BLOCK FUSE STATUS ON ACT CAB 5
ESR02	8A BLOCK FUSE STATUS ON ACT CAB 6
ESR03	8A SIAS FUSE ON ACT CAB 5
ESR04	8A SIAS FUSE ON ACT CAB 6
FWR01	SJAEA STM AND COND INLET AR2A & MS59A
FWR02	SJAEB STM AND COND INLET & MS59B
FWR03	COND PUMP P2A DISCH VLV 2-CN-4A(%)
FWR04	COND PUMP P2B DISCH VLV 2-CN-4B(%)
FWR05	COND PUMP P2C DISCH VLV 2-CN-4C(%)
FWR06	COND PUMP T CW DISCH 2-CN-503(%)
FWR07	LP HEATERS BYPASS VLV 2-CN-15(%)
FWR08	DRAINS COOLER "A" INLET 2-CN-11A(%)
FWR09	DRAINS COOLER "B" INLET 2-CN-11B(%)
FWR10	MFWP'S BYP VLV 2-CN-51(%)
FWR11	HP HTR 1A, 1B BYP VLV 2-FW-6(%)
FWR12	HP HTR 1A IN&OUTLET ISOL 2-FW-2A,3A(%)
FWR13	HP HTR 1B IN&OUTLET ISOL 2-FW-2B,3B(%)
FWR14	MAKEUP TO TDAFP P4 2-CN-30,2-FIRE-94C
FWR15	MAKEUP TO AFW P9A 2-CN-29A,2-FIRE-94A
FWR16	MAKEUP TO AFW P9B 2-CN-29B,2-FIRE-94B
FWR17	#1 SG AUX FRV BYP2-FW-56A (%)
FWR18	#2 SG AUX FRV BYP2-FW-56B (%)
FWR19	VACUUM PUMP F5A SUCTION ISOL 2-AR-12A
FWR20	VACUUM PUMP F5B SUCTION ISOL 2-AR-12B
FWR21	HOT WELL REJECT LCV ISOL 2-CN-21
FWR22	AUX FEED SV4188 LOCAL OPERATION
FWR23	AUX FEED GOVERNOR VALVE POS (%)
FWR24	DRN CLR A INLET EQUALIZER 2-CN-214A(%)
FWR25	DRN CLR B INLET EQUALIZER 2-CN-214B(%)
FWR26	HTR DRAIN PUMP P3A DISCH ISOL 2-HD-91(%)
FWR27	HTR DRAIN PUMP P3B DISCH ISOL 2-HD-9B(%)
FWR28	HTR DRN PUMP P3A RECIRC STOP 2-HD-45A
FWR29	HTR DRN PUMP P3B RECIRC STOP 2-HD-45B
FWR30	COND TRANSFER PUMP P71
FWR31	COND SRG TK FILL FROM COND TRANS CN-206
FWR32	COND FILL FROM COND TRANS 2-CN-223
FWR36	MECHANICAL VACUUM PUMP SET POINT (INHG)
FWR37	LONG RE-CYCLE VALVE AOV20(%)
FWR38	COND DEMINS 1A,1B,1C,1D,1E,1F,1G IN SERV
FWR39	CST/SURGE TK M/U TO HW 2-CN-100,34

FWR41	FW REG VLV 2FW51A NORMAL/HAND CONTROL
FWR42	FW REG VLV 2FW51A MANUAL VLV POSITION
FWR43	FW REG VLV 2FW51B NORMAL/HAND CONTROL
FWR44	FW REG VLV 2FW51B MANUAL VLV POSITION
FWR45	FRV 2FW51A LEAKAGE (VLV POS %)
FWR46	FRV 2FW51B LEAKAGE (VLV POS %)
FWR47	FPT 1A AUX OIL PUMP TEST PB(HS-7185)
FWR48	FPT 1A EMERG OIL PUMP TEST PB(HS-7186)
FWR49	FPT 1B AUX OIL PUMP TEST PB(HS-7135)
FWR50	FPT 1B EMERG OIL PUMP TEST PB(HS-7136)
FWR51	COND 1A EVAC SUCT VLV 2AR1A
FWR52	COND 1A EVAC SUCT VLV 2AR1B
FWR53	COND 1B EVAC SUCT VLV 2AR1C
FWR54	COND 1B EVAC SUCT VLV 2AR1D
FWR55	MAKEUP TO CST(GPM)
FWR56	TRAIN A LP HEATER ISOL 2-CN-12A,43A POS (%)
FWR57	TRAIN B LP HEATER ISOL 2-CN-12B,43B POS (%)
FWR58	FIRE PUMP ALARM STATUS
FWR59	#1 SG AUX FRV 2-FW-43A
FWR60	#2 SG AUX FRV 2-FW-43B
FWR61	#1 SG AUX FW ISO VLV 2-FW-18A
FWR62	#2 SG AUX FW ISO VLV 2-FW-10B
FWR63	#1 SG FRV 2-FW-43A
FWR64	#2 SG FRV 2-FW-43B
FWR65	COND PUMP A BREAKER (H106) RI/RO
FWR66	COND PUMP B BREAKER (H107) RI/RO
FWR67	COND PUMP C BREAKER (H203) RI/RO
FWR68	AUX FEED PMP A BREAKER (A307) RI/RO
FWR69	AUX FEED PMP B BREAKER (A406) RI/RO
FWR70	HTR DRN PUMP A BREAKER (A105) RI/RO
FWR71	HTR DRN PUMP B BREAKER (A203) RI/RO
FWR72	REFUEL LOAD CENTER TRANSFER SWITCH
IAR01	SA CTMT HDR ISOL 2-SA-19
IAR02	TURBINE BLDG IA ISOL (2-IA-25)
IAR03	IA CMPR F3A SW HS-7046
IAR04	IA CMPR F3B SW HS-7055
IAR05	IA CMPR F3A,B SEL SW HS-7046A
IAR06	SA CMPR F2 SW HS-7086A
IAR07	TURB BLDG IA HDR AIR LEAKAGE(SCFM)
IAR08	ENCL & AUX BLDG IA HDR AIR LEAKAGE(SCFM)
IAR09	CONTAINMENT IA HDR AIR LEAKAGE(SCFM)
IAR10	UNIT 1 SA SPLY BV 2SA12, 2SA12A
IAR11	IA CMPR F3A RESET SW
IAR12	IA CMPR F3B RESET SW
IAR13	SA CMPR F2 CNROL HS-7086B
IAR14	CW PRIMING EDUCTOR LOAD (SCFM)
IAR15	IA CMPR F3C START/STOP SWITCH
IAR16	IA CMPR F3C RESET SWITCH
IAR17	IA CMPR F3C SEL SWITCH
IAR18	IA TO STEAM DUMP VLV IA-47

FIGURE 7.1

CERTIFIED REMOTE FUNCTIONS LIST

UNIT 2 PAGE 6 OF 10

IAR19	IA ALT SUPPLY TO FW VLV IA-101
IAR20	IA TO AUX BLDG VLV IA-28
IAR21	C COMPRESSOR TO RECEIVER IA-542
IAR22	IA TO SA CROSSTIE VLV IA-641
MSR01	#1 ATM STM DUMP ISOL 2-MS-3A
MSR02	#2 ATM STM DUMP ISOL 2-MS-3B
MSR03	MSR 1A/1B HI LOAD VL 20-MS-85A,85B
MSRO4	MSR 1A/1B HI LOAD A/B POS(%)
MSR05	MSR 1A LOW LOAD VALVE 2-MS-79A
MSR06	MSR 1A LOW LOAD VALVE 2-MS-79A POS(%)
MSR07	MSR 1B LOW LOAD VALVE 2-MS-79B
MSR08	MSR 1B LOW LOAD VALVE 2-MS-79B POS(%)
MSR09	AUX STEAM SUPPLY
MSR11	TURBINE SHELL WARMING MODE VLV STATUS
MSR12	2-MS-201 CLOSING COIL/RACKOUT
MSR13	2-MS-202 CLOSING COIL/RACKOUT
MSR14	#1 ATM STM DUMP 2-MS-190A
MSR15	#1 ATM STM DUMP 2-MS-190A POS (%)
MSR16	#2 ATM STM DUMP 2-MS-190B
MSR17	#2 ATM STM DUMP 2-MS-190B POS (%)
RCR01	PZR VENT VALVES 2-RC-021, & 2-RC-421
RCR02	PZR/RCS/CVCS BORON CONC (PPM)
RCR03	PRESSURIZER BORON CONC (PPM)
RCR04	RCP-40A RACKOUT
RCR05	RCP-40B RACKOUT
RCR06	RCP-40C RACKOUT
RCR07	RCP-40D RACKOUT
RCR08	PZR N2 SUPPLY 2-RC-030 & 2-RC-015
RCR10	HOT LEG LOOP 1 LEVEL VALVE 2-RC-214
RCR11	PZR PROPORTIONAL HTR BKRS
RCR12	PZR B/U HTR BKRS
RCR13	VENT VALVE 2-EB-86
RCR14	2-RC-039, 413 AND 447
RCR15	2-RC-448
RHR01	SDC SUCTION HDR MAN STOP 2-SI-709
RHR02	A LPSI PUMP SUCT FROM SDC 2-SI-441
RHR03	B LPSI PUMP SUCT FROM SDC 2-SI-440
RHR04	A LPSI PUMP SUCT FROM RWST 2-SI-444
RHR05	B LPSI PUMP SUCT FROM RWST 2-SI-432
RHR06	LPSI PP P-42A RECIRC VLV 2-SI-449
RHR07	LPSI PP P-42B RECIRC VLV 2-SI-450
RHR08	CTMT SPRAY PP P-43A RECIRC VLV 2-CS-7A
RHR09	CTMT SPRAY PP P-43B RECIRC VLV 2-CS-7B
RHR10	CTMT SPRAY PP P-43A DISCH VLV 2-CS-3A
RHR11	CTMT SPRAY PP P-43B DISCH VLV 2-CS-3B
RHR12	LPSI PP DISCH TO SDC HX A 2-SI-452
RHR13	LPSI PP DISCH TO SDC HX B 2-SI-453
RHR14	CTMT SPRAY HDR A VLV 2-CS-4A & 2-SI-456
RHR15	CTMT SPRAY HDR B VLV 2-CS-4B & 2-SI-457
RHR16	SIT RECIRC HDR STOP 2-SI-463
RHR17	CTMT SPRAY PP P-43A RACKOUT
RHR18	CTMT SPRAY PP P-43B RACKOUT

RHR19	LPSI PP P-42A RACKOUT
RHR20	LPSI PP P-42B RACKOUT
RHR21	SIT RECIRC HDR STOP 2-SI-459
RHR22	CS HDR A TO SI TEST HDR ISO 2-CS-51
RHR23	CS HDR B TO SI TEST HDR ISO 2-CS-50
RHR24	SDC WARMUP LINE 2-SI-400 POS %
RHR25	SDC DISCHG TO CVCS 2-SI-040
RHR26	SDC DISCHG TO RWST 2-SI-460 POS %
RHR27	2-SI-306 AIR SUPPLY, FUSE BLOCK
RHR28	SDC FLOW CONTROL VALVE 2-SI-657
RHR29	SDC FLOW CONTROL VALVE 2-SI-657 POS %
RHR30	SIAS REMOVED FROM LPSI VALVES
RHR31	CORE DELAY HEAT FACTOR
RMR01	RIT-4262 ALARM DEFEAT SWITCH
RMR03	RIT-6038 ALARM DEFEAT SWITCH
RMR04	RIT-7890 ALARM DEFEAT SWITCH
RMR05	RIT-7891 ALARM DEFEAT SWITCH
RMR06	RIT-7892 ALARM DEFEAT SWITCH
RMR07	RIT-7894 ALARM DEFEAT SWITCH
RMR08	RIT-7895 ALARM DEFEAT SWITCH
RMR09	RIT-7896 ALARM DEFEAT SWITCH
RMR10	RIT-7897 ALARM DEFEAT SWITCH
RMR11	RIT-7899 ALARM DEFEAT SWITCH
RMR12	RIT-8011 ALARM DEFEAT SWITCH
RMR13	RIT-8123A ALARM DEFEAT SWITCH
RMR14	RIT-8123B ALARM DEFEAT SWITCH
RMR15	RIT-8132A ALARM DEFEAT SWITCH
RMR16	RIT-8132B ALARM DEFEAT SWITCH
RMR17	RIT-8139 ALARM DEFEAT SWITCH
RMR18	RIT-8142 ALARM DEFEAT SWITCH
RMR19	RIT-8145A ALARM DEFEAT SWITCH
RMR20	RIT-8145B ALARM DEFEAT SWITCH
RMR21	RIT-8156 ALARM DEFEAT SWITCH
RMR22	RIT-8157 ALARM DEFEAT SWITCH
RMR23	RIT-8262A ALARM DEFEAT SWITCH
RMR24	RIT-8262B ALARM DEFEAT SWITCH
RMR25	RIT-8434A ALARM DEFEAT SWITCH
RMR26	RIT-8434B ALARM DEFEAT SWITCH
RMR27	RIT-8997 ALARM DEFEAT SWITCH
RMR28	RIT-8998 ALARM DEFEAT SWITCH
RMR29	RIT-8999 ALARM DEFEAT SWITCH
RMR30	RIT-9049 ALARM DEFEAT SWITCH
RMR31	RIT-9095 ALARM DEFEAT SWITCH
RMR32	RIT-9116 ALARM DEFEAT SWITCH
RMR33	RIT-9327 ALARM DEFEAT SWITCH
RMR34	RI-8123A ALARM DEFEAT SWITCH
RMR35	RI-8132A ALARM DEFEAT SWITCH
RMR36	RI-8262A ALARM DEFEAT SWITCH
RPR01	TCB-9 BREAKER

FIGURE 7.1

CERTIFIED REMOTE FUNCTIONS LIST

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RPR02	MG SET A INPUT CONTACTOR
RPR03	MG SET A OUTPUT BREAKER
RPR04	MG SET A OUTPUT CONTACTOR
RPR05	MG SET B INPUT CONTACTOR
RPR06	MG SET B OUTPUT BREAKER
RPR07	MG SET B OUTPUT CONTACTOR
RPR12	COMPARATOR AVERAGER SELECT CHANNEL-A
RPR13	COMPARATOR AVERAGER SELECT CHANNEL-B
RPR14	COMPARATOR AVERAGER SELECT CHANNEL-C
RPR15	COMPARATOR AVERAGER SELECT CHANNEL-D
RPR16	CH-X INPUT TO POWER RATIO CALCULATOR
RPR17	CH-Y INPUT TO POWER RATIO CALCULATOR
RPR18	CH A&B HI PZR PRESS MODULE DESCONN
RPR19	VARIABLE HI POW TRIP
RPR20	RCP LO SPEED TRIP
RPR21	RCS LO FLOW TRIP
RPR22	SG #1 LO LEVEL TRIP
RPR23	SG #2 LO LEVEL TRIP
RPR24	SG #1 LO PRESS TRIP
RPR25	SG #2 LO PRESS TRIP
RPR26	HI PZR PRESS TRIP
RPR27	TM/LP TRIP
RPR28	TURBINE/REACTOR TRIP
RPR29	HI CONTAINMENT PRESS TRIP
RPR30	LOCAL POWER DENSITY TRIP
RPR31	POWER RATIO RECORDER TENT SELECTED
RPR32	ATWS TRIP DEFEAT
RPR33	A CEDM MG SET BKR
RPR34	B CEDM MG SET BKR
RPR35	PWR RATIO HI/LO ALARM BYPASS
RXR01	LOOP 1 SEL FOR TAVG CALC IN RRS-UNIT 1
RXR02	LOOP 2 SEL FOR TAVG CALC IN RRS-UNIT 1
RX203	LOOP 1 SEL FOR TAVG CALC IN RRS-UNIT 2
RXR04	LOOP 2 SEL FOR TAVG CALC IN RRS-UNIT 2
RXR05	LO LO PZR LEVEL HEATER TRIP DEFEATED
RXR06	PZR PRCP HTR BKRS IN TEST POSITION
SGR01	BD TK INLETS 2-MS-381A&B(100%=6 TURNS)
SGR02	BD Q TK INLETS 2-MS-218,219(100%=6 TURNS)
SIR01	HPSI PP P-41A RACKOUT
SIR02	HPSI PP P-41B RACKOUT
SIR03	HPSI PP P-41C RACKOUT
SIR04	T-39A SI-614 RACKOUT/CL COIL REMOVAL
SIR05	T-39B SI-624 RACKOUT/CL COIL REMOVAL
SIR06	T-39C SI-634 RACKOUT/CL COIL REMOVAL
SIR07	T-39D SI-644 RACKOUT/CL COIL REMOVAL
SIR08	SI TANK VENT LINE CAPS
SIR09	2-SI-654 BKR
SIF10	2-SI-656 BKR
SIR11	2-SI-617/27/37/47 BKRS
SIR12	2-SI-616/26/36/46 BKRS
SWR01	SW PUMP A DISCHG 2-SW-2A
SWR02	SW PUMP B DISCHG 2-SW-2B

FIGURE 7.1

CERTIFIED REMOTE FUNCTIONS LIST

UNIT 2 PAGE 9 OF 10

SWR03	SW PUMP C DISCHG 2-SW-2C
SWR04	RBCCW HX A/B XCONN 2-SW-7B
SWR05	RBCCW HX B/C XCONN 2-SW-7A
SWR06	TPCCW HX A/B XCONN 2-SW-4B
SWR07	TPCCW HX B/C XCONN 2-SW-4A
SWR08	RBCCW HX A OUTLET VLV MODE
SWR09	RBCCW HX B OUTLET VLV MODE
SWR10	RBCCW HX C OUTLET VLV MODE
SWR11	ISOL VLV 2-SW-5A TO TP HX-17A(%)
SWR12	ISOL VLV 2-SW-5B TO TP HX-17B(%)
SWR13	ISOL VLV 2-SW-5C TO TP HX-17C(%)
SWR16	VITAL AC CLR 181 ISOL OUTLET 2-SW-181A%
SWR17	VITAL AC CLR 182 ISOL OUTLET 2-SW-181B%
SWR18	VITAL AC CLR 183 ISOL OUTLET 2-SW-181C%
SWR19	"A" SW HDR TO CHILLERS 2-SW-194
SWR20	"B" SW HDR TO CHILLERS 2-SW-195
SWR21	SW TO AC SWGR CLRS XTIE 2-SW-175
SWR22	SW PUMP B/STRAINER POWER SUPPLY
SWR23	A RBCCW HX OUTLET 2-SW-9A (%)
SWR24	B RBCCW HX OUTLET 2-SW-9B (%)
SWR25	C RBCCW HX OUTLET 2-SW-9C (%)
SWR26	SW PUMP "B" BREAKER STATUS
SWR27	SW PUMP "A" BREAKER
SWR28	SW PUMP "C" BREAKER
SWR29	FIRE WATER SUPPLY TO A D/6
SWR30	FIRE WATER SUPPLY TO B D/6
TCR01	EHC BYP VALVE POS. (FV-1) (%)
TCR02	EHC OIL PUMP TEST (FV9/10)
TCR03	CONDENSER LOW VAC TRIP
TCR04	BRG OIL PRESS LO TRIP
TCR05	SHAFT PUMP PRESS LO TRIP
TCR06	LOSS OF STATOR COOLANT TRIP
TCR07	EHC HYD PRESS LO TRIP
TCR08	MSR HI LVL TRIP
TCR09	UNIT ELECTRICAL PROTECTION TRIP
TCR10	REACTOR/TURB TRIP
TCR11	MANUAL EMERG PB TRIP
TCR12	SG #1 HI LVL TRIP
TCR13	SG #2 HI LVL TRIP
TCR14	EXHAUST HOOD TEMP HI TRIP
TCR15	PMG MALFUNCTION LIGHT RESET
TPR01	TBCCW SURGE TGK SUPPLY 2-PMW-219
TPR02	TBCCW PUMP A DISCHG 2-TB-3A (%)
TPR03	TBCCW PUMP A DISCHG 2-TB-3B (%)
TPR04	TBCCW PUMP C DISCHG 2-TB-3C (%)
TPR05	TIC-6305 HX-17A TO VLV 2-SH-88A(F)
TPR06	TIC-6304 HX-17B TO VLV 2-SW-88B(F)
TPR07	TIC-6303 HX-17C TO VLV 2-SW-88C(F)
TPR08	TBCCW SURGE TK DRAIN 2-TB-211
TPR09	HYDROGEN SUPPLY VLV SETPOINT (PSIG)
TPR10	TBCCW PUMP SEAL LEAKAGE (GPH)
TPR11	ISO-PHASE BUS FAN A C5
TPR12	ISO-PHASE BUS FAN B C5

TPR15	TBCCW HX A OUTLET 2-TB-5A
TPR16	TBCCW HX B OUTLET 2-TB-5B
TPR17	TBCCW HX C OUTLET 2-TB-5C
TPR18	ALTERNATE WATER SUPPLY TO IA AFT/COMP
TPR19	SLO STBY PUMP TEST (Y-76,Y-45)
TPR20	ALL REMOTE PANEL ALARM RESET
TUR01	MSP AUTO START TEST (2-LO-60)
TUR02	TGOP HYD OIL TEST (2-LO-55A)
TUR03	EBOP OIL TEST (2-LO-103A/55B)
TUR04	EMERG BEARING OIL PUMP (RI/RO)
WDR01	AERATED WASTE DRAIN TANK PUMP P31A
WDR02	EQUIP. DRN TNK SUMP PMPS P94A,B
WDR03	DEGASIFIER 3 WAY,VLV 2-LRR-7.1
WDR04	RBCCW SUMP PUMPS P38A,B
WDR05	RBCCW SUMP TO LI SOUND 2-SSP-21
WDR06	DEGASIFIER BYPASS VALVE 2-LRR-69

ATTACHMENT 12

COMMONLY USED ABBREVIATIONS AND DEFINITIONS

SIMULATOR SYSTEM ABBREVIATIONS

CC	Component Cooling - Reactor Building Component Cooling Water (RBCCW)
CH	Containment Heating and Ventilating (HVAC)
CR	Reactor Core
CV	Chemical and Volume Control System (CVCS)
CW	Circulating Water
ED	Electrical Distribution
EG	Electrical Generation
ES	Engineered Safety Actuation System (ESAS)
FW	Feedwater
IA	Instrument Air
MS	Main Steam
PC	Process Computer
RC	Reactor Coolant System
RD	Control Rod Drive System
RH	Residual Heat Removal/Shutdown Cooling System
RM	Radiation Monitoring
RP	Reactor Protection System (RPS)
RX	Reactor Regulating System (RRS)
SG	Steam Generators
SI	Safety Injection
SW	Service Water
TC	Turbine Controls
TP	Turbine Building Components Cooling Water (TBCCW)
TU	Turbine
WD	Waste Disposal

COMMON ABBREVIATIONS

Abbreviations	Full Name
AI	Analog Input
AO	Analog Output
ANS 3.5	ANSI/ANS 3.5 (1985)
ARO	All Rods Out
BOL	Beginning of Life
CAR	Containment Air Recirculation
CEA	Control Element Assembly
CEDS	Control Element Drive System
CIAS	Containment Isolation Actuation Signal
CRAC	Control Room Air Conditioning
CVCS	Chemical and Volume Control System
DG	Diesel Generator
DI	Digital Input
DO	Digital Output
DR	Deficiency Report
EBFAS	Enclosure Building Filtration Actuation Signal
EDG	Emergency Diesel Generator
EOL	End of Life
EOP	Emergency Operating Procedure
ESAS	Emergency Safeguards Actuation System
HFP	Hot Full Power
HPSI	High Pressure Safety Injection
HZP	Hot Zero Power
IC	Initial Condition
ITC	Isothermal Temperature Coefficient
LNP	Loss of Normal Power
LPSI	Low Pressure Safety Injection
MOL	Middle of Life

COMMON ABBREVIATIONS

Abbreviations	Full Name
MP2	Millstone Point Unit #2
MSIV	Main Steam Isolation Valve
MLSB	Main Steam Line Break
MTC	Moderator Temperature Coefficient
MWE	Megawatts Electric
NSEM	Nuclear Simulator Engineering Manual
PDCR	Plant Design Change Request
PPC	Plant Process Computer
PTL	Pull-To-Lock
RBCCW	Reactor Building Component Cooling Water
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RPS	Reactor Protection System
RRS	Reactor Regulating System
SCCC	Simulator Configuration Control Committee
SDC	Shutdown Cooling System or Simulator Design Change
SIAS	Safety Injection Actuation Signal
SIG	Simulator Instructor Guide
SIT	Safety Injection Guide
SOER	Significant Operating Event Report
SSD	Simulator System Diagram
S/G	Steam Generator
SW	Service Water
TBCCW	Turbine Building Component Cooling Water
TM/LP	Thermal Margin/Low Pressure

DEFINITIONS

Anomalous Response - Simulator response which violates the physical laws of nature or differs greatly from expected response. Expected response may be based on plant data, accident analysis, or best estimate evaluation.

ANS 3.5 - Anytime ANS 3.5 is listed in this document, it refers to ANSI/ANS 3.5 (1985).

Axial Shape Index (A.S.I) - Common term used in reactor core axial power distributions measurement. It is an index which describes the relative amount of power between the top and bottom halves of the reactor core.

Backtrack - The ability to move the simulator back in time to conditions which had previously existed. This is accomplished by the automatic storage (at one minute intervals) of the simulators I/O's over the past hour.

Best Estimate Evaluation - A method used, (in the absence of plant data, engineering analysis, or accident analysis), to determine the direction, rate, and magnitude of response for critical plant parameters during transient and accident conditions. Experience, rough engineering calculations and mass/energy balances, and table-top discussion may all be used to determine best estimate response.

Boolean Trigger - An algebraic expression which is used to automatically activate a malfunction when its value becomes true.

"Cause & Effect" Document - A description of the simulator response (effect) to the insertion of a specific malfunction or malfunctions. Each malfunction description also contains they physical "cause" of the malfunction as well as a description of the significant effects on plant operation due to the malfunction.

Certified IC - An IC which has been reviewed by an SRO qualified instructor and verified to have consistent control board and remote function conditions as the reference plant would under the same conditions.

Certified Remote Function - Those remote functions which will be tested to work correctly and may be used in simulator training and exams.

Composite Malfunction - A combination of up to 10 predefined simple malfunctions which can be arranged in a logical sequence. Once built, this composite malfunction is stored and can be used at any time.

Core Performance Testing - Plant heat balance, determination of shutdown margin, measurement of reactivity coefficients and control rod worth using permanently installed instrumentation.

Critical Parameters - Those parameters, specific to a given major malfunction, which are driven directly by the initiating event, required for diagnosis, or required to verify proper plant response to safety equipment actuations and/or operators' corrective actions.

Deficiency - An identified difference in a simulator quality or element (hardware and/or software) that requires review and resolution.

Deficiency Report (DR) - Form (STS-BI-F1A) used by the Operator Training Branch (OTB) and the Process Computers and Simulators (PC&S) to record all identified simulator deficiencies between the simulator and reference plant.

Design Limits - Extreme values for specified plant parameters. Design limits are obtained from engineering design and accident analysis documents, e.g.: maximum RCS pressure, peak containment pressure, etc.

EOP's - Emergency Operating Procedures address the required response by operations personnel to emergency conditions.

Fast Time - The increase in the speed at which certain parameters (such as Xenon, condenser air evacuation, RCS heatup, RCS cooldown, turbine metal heatup, turbine metal cooldown, and decay heat) are modeled to change.

Freeze - The stopping of all simulator dynamic modeling. When the simulator is taken out of freeze, the model will continue to run from the time that it was placed in freeze.

Hot Standby Operations - Maintaining stable plant conditions at hot standby.

Input/Output (I/O) - Any digital or analog computer inputs/outputs.

Initial Conditions (IC's) - A set of analog/digital points that are stored on the Simulator's Computers so that a starting point is available for a Simulator session. Physical components (handswitches, relays, etc.) must also be manipulated to match the analog/digital initialization points (switchcheck).

Load Changes - Increasing and decreasing plant load.

Major Malfunction - Those malfunctions which produce extensive integrated effects in a number of plant systems which requires complicated analysis to verify acceptable response.

Major Plant Modification - A significant change made to the reference plant which cannot be trained around on the simulator and would result in negative training. Major plant modifications such as the extensive component relocations/changeouts associated with a Control Room Design Review, seriously challenge the ability of the simulator to function as a plant-referenced training/examining tool.

Malfunction - A specific equipment failure which produces discernible indications in the Control Room that replicates the same equipment failure should it occur in the reference plant. Specific preprogrammed malfunctions are available at the simulator instructor station.

Model Limits - Physical conditions which cannot be simulated by the model coding, e.g.: critical pressure and temperature, core melt, clad melt, etc.

Normal Plant Evolutions - Evolutions that the simulator shall be capable of performing, in real time, that simulate routine reference plant evolutions.

NSEM - The Nuclear Simulator Engineering Manual contains all of the procedures necessary for the development and implementation of the certification program. To insure consistent application of the certification process. This manual is controlled by the PC&S to ensure all copies are current.

Nuclear Start-Up - From all CEA's fully inserted to going critical at hot standby conditions.

Operability Testing - A defined group of tests conducted to verify:

1. The overall completeness of integration of the simulation model,

2. Steady state performance for a benchmark set of transients

3. Simulator performance for a benchmark set of transients against established criteria. Operability testing is a subset of the Performance Test and is required annually for maintenance of certification.

Performance Test - A defined group of tests conducted to verify a simulation facility's performance as compared to actual or predicted reference plant performance. A performance test is required for initial certification and for every subsequent four year period in order to maintain certification. Performance testing for certification maintenance is intended to be an on-going process with approximately 25% of the testing performed during each year of the four year cycle.

PDCR - A Plant Design Change Record which contains all necessary information and forms to accomplish in an orderly manner, the modification of a plant system, structure or component.

Plant Shutdown - Shutdown from rated power to hot standby, then cooldown to cold shutdown conditions.

Plant Startup - The starting conditions shall be cold shutdown temperature and pressure to hot standby temperature and pressure. The Reactor Vessel Head need not be removed for cold shutdown.

Reference Plant Data Book (PDB) - A compilation of reference plant data for specific plant transients/evolutions. The data defines plant parameters response to specific initiating events or evolutions. Reference plant data may be used to verify simulator response for certification testing, for training development, or as supporting data for DR submittal.

Remote Function - An instructor initiated input to the simulator model which will provide the same discernible effects as the corresponding manual operation in the reference plant.

Simulator Configuration Control Committee (SCCC) - The committee responsible for overall simulator design control and management of NTD resources involved in the simulator modification effort. The SCCC shall include 1) MP2 OPS MGR (Chairman), 2) MGR Process Computers and Simulators, 3) Supervisor Software Computer Engineering, 4) Supervisor/Assistant Supervisor MP2 Operator Training, 5) MP2 Simulator Operations Assistant, 6) MP2 Software Engineer, 7) MP2 Hardware Technician.

Simulator Design Change (SDC) - A documentation package consisting of relevant DR's and all forms indicated on STS-BI-F1E which is designed to track the resolution of DR's and ensure that ANSI/ANS 3.5-1985, and NRC Reg. 1.149 requirements are satisfied.

Simulator Instructor Guide (SIG) - A training document outlining the sequence of events for a simulator training session. SIG's also contain additional information for the instructor conducting the session.

Simulator Operating Limit - A given simulator condition beyond which simulation is unrealistic or inaccurate and negative training may be provided. Simulator operating limits may be imposed due to plant design limits, computer code model limits, or observed anomalous response.

Simulation System Diagram (SSD) - Functional representation of the simulator modeling for a given system.

Slow Time - In reality, this is the expansion of real time which produces the appearance that a transient is occurring at a slower speed. The slow time which can be selected can vary from 5% to 95% of real time (at 5% increments).

Snapshot - The recording of the present status of all simulator digital/analog I/O's. After this snapshot is taken, the simulator may be initialized to this condition at some later time.

SOER - Significant Operating Event Report is generated by INPO and distributed to industry members. It includes recommendations concerning the event which must be addressed by concerned facilities.

SRO Qualified Instructor - An instructor who is (or was in the past) an NRC licensed (or certified) Senior Reactor Operator, who by nature of his training and experience, has the knowledge to make decisions on proper plant system alignments for given operating conditions.

Surveillance Testing - Operation conducted surveillance testing on safety related equipment or systems.

Turbine Generator Start-Up - Turbine Generator at zero RPM, to rated speed and synchronization to grid.

ATTACHMENT 13

QUALIFICATIONS OF PERSONNEL DEVELOPING AND PERFORMING SIMULATOR TESTING

This attachment lists the Nuclear Training Department personnel involved in developing and conducting Millstone 2 Simulator Recertification Testing. A brief description of the relevant qualifications is provided with each individual.

As is readily apparent, an excellent mix of operating, training, engineering and simulation software experience is represented by these individuals.

Only those personnel directly involved are included.

SIMULATOR TECHNICAL SUPPORT BRANCH

Lung-Rui Huang - Supervisor, Simulator Computer Engineering

NU Experience:

- Twelve years in Simulation Computer Engineering as both a Senior Engineer and Supervisor.
- Two years in Probabilistic Risk Assessment and Safety Analysis with Reactor Engineering

Other Related Experience:

- Four years simulation experience including Technical Staff Leader with Electronic Associates, Incorporated.
- Six years university teaching experience at National Tsing Hua University and Iowa State University in Nuclear and Electrical Engineering Departments.

Education:

- PhD in Nuclear Engineering

Shih-Kao Chang - Senior Engineer, Simulation Computer Engineering

NU Experience:

- Eleven years in Simulation Computer Engineering as an Engineer and Senior Engineer, with lead responsibility for NU Reactor Core and RCS modeling disciplines.

Other Related Experience:

- Four years simulation experience with Singer Link-Miles Simulation Corporation, including the position of Section head, PWR NSSS Modeling.

Education:

- PhD in Nuclear Engineering

Hsin-Cheng Huang - Engineer, Simulation Computer Engineering

NU Experience:

- Ten years in Simulation Computer Engineering as an Engineer.

Other Related Experience:

- Three years simulation experience with Singer Link-Miles Simulation Corporation.

Education:

- PhD in Mechanical Engineering with specialization in Thermofluids and Thermohydraulics.

John H. Rein - Supervisor, Operator Training, Millstone 2

NU Experience:

- Three and one-half years in Operator Training as a supervisor responsible for simulator performance and all aspects of operator training.
- Ten years in Operator Training as an operator instructor responsible for coordinating, development, and delivery of all aspects of operator training. This also included simulator construction, startup and testing responsibilities.
- Two years as a Connecticut Yankee Auxiliary Operator.

Other Related Experience:

- One and one-half years as an operator instructor at Louisiana Power & Light responsible for all development, and delivery of all aspects of operator training.

NRC Licenses:

- RO License (CY)
- SRO Instructor Certification (Waterford 3)
- SRO Instructor Certification (CY)

<u>Ronald G. Stotts</u> - Assistant Supervisor, Operator Training Millstone 2

<u>NU Experience:</u>

- Six years at MP1 in both Operations and in Operator Training.
- Nine years at MP3 Operator Training in various positions from Instructor to Supervisor MP3 Operator Training.
- Three years at MP2 Operator Training as Assistant Supervisor MP2 Operator Training.

<u>Other Related Experience:</u>

- Four years, U.S. Navy

<u>NRC Licenses:</u>

- SRO Licensed MP1
- SRO Licensed MP3

Richard N. Spurr - LORT Coordinator, Operator Training, Millstone 2

NU Experience:

- Three years in Operator Training as the supervisor responsible for simulator performance and training.
- Ten years in Operator Training as a Senior Operator Instructor, including simulator construction, startup and testing responsibilities.
- Three years as a Millstone 2 Shift Supervisor.
- Five years as a Millstone 2 Supervising Control Operator.

Other Related Experience:

- Six years, U.S. Navy

NRC Licenses:

- Currently SRO Licensed, MP2 (21 years)

Robert H. Burnside - Simulator Operations Assistant

NU Experience:

- Six and one-half years in Operator Training as a Senior Operator Instructor.
- Two years in Operating Training as a Simulator Operations Assistant.
- Eleven years as a Millstone 2 Shift Supervisor.
- Twelve years additional operating experience, including Control Operator at the Haddam Neck Plant.

NRC Licenses:

- Previously SRO Licensed, MP2 (19 years)
- Currently retired

William H. Souder - Simulator Operations Assistant

NU Experience:

- Twelve and one-half years in Operator Training as an Operator Instructor, including simulator construction, startup and testing responsibilities.
- One year as MP2 Simulator Operations Assistant

Other Related Experience:

- Four years as a Simulator Instructor at the Combustion Engineering Simulator.
- Fourteen years, U.S. Navy, including Engineering Officer of the Watch, Qualifications and power plant protype training experience.

NRC Licenses:

- Currently SRO Licensed, MP2 (eleven years)