VOLUME 3

MILLSTONE UNIT 1 SIMULATOR PERFORMANCE TEST REPORT

MILLSTONE UNIT 1 SIMULATOR

PERFORMANCE TEST SUMMARY

VOLUME 3

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SUMMARY OF PERFORMANCE TESTING

The Millstone 1 Simulator was declared "Ready for Training" on June 12, 1986 . An Acceptance Test Procedure (ATP) was performed prior to using the Millstone 1 Simulator for operator training.

In March, 1987, 10 CFR 55.45 was issued requiring certification of Simulation Facilities. Northeast Utilities (NU) formulated a comprehensive testing program to meet the requirements of 10 CFR 55.45, ANSI/ANS 3.5 (1985) and Regulatory Guide 1.149 (1987). The purpose of this program was to provide systematic and detailed assurance that NU Simulators meet or exceed regulatory requirements and provide the best possible simulator training to its licensed operators. The generic procedures which make up the Northeast Utilities Simulator Certification Program are included in Volume 2 labeled "Nuclear Simulator Engineering Manual" (NSEM).

Utilizing the generic procedures in the NSEM for guidance, a Millstone 1 specific Performance Test was written. This Performance Test was conducted on the Millstone 1 Simulator starting in March 1988 and finishing in June 1990. Volumes 3 and 4 of this submittal describe the Millstone 1 Performance Test and its results. While the generic procedures covering Simulator Certification are contained in Volume 2, the Millstone 1 specific Performance Test procedures are not included in this submittal. The Millstone 1 specific Performance Test procedures and results are available for review upon request. Abstracts of these procedures together with test results are presented in this submittal. The Millstone 1 Performance Test will be repeated over a four year interval as described in Section 13 of this submittal.

This volume contains the following 13 sections and 15 attachments.

- o Section 1 provides a description of testing methodology and assumptions.

- o Sections 2 through 10 review and summarize the individual tests which make up the Millstone 1 Simulator Performance Test.

- o Section 11 reviews and summarizes the procedural controls for maintaining certification of the Millstone 1 Simulator.

- o Section 12 provides a timetable for resolving open deficiencies on the Millstone 1 Simulator. As of June 26, 1990, there are 245 open deficiencies on the Millstone 1 Simulator.

- o Section 13 discusses the testing sequence for the next four (4) year certification period, July 1990 through June 1994.

- o Attachments 1 through 13 provide supporting documentation for sections 1 through 12. The attachments are referenced in the appropriate sections of this summary. Attachment 14 provides a list of abbreviations and definitions. Attachment 15 contains a list of experience levels of test personnel.

Volume 4 contains an index of all malfunctions on the Millstone 1 Simulator. The 247 malfunctions that are within the scope of simulation required for training were certified. Those malfunctions <u>not</u> certified are denoted in the list with an asterisk. If, in the future, any of these is needed, it can be certified via the procedure found in NSEM 6.02. Following the index is an individual "Cause and Effects" description for each certified malfunction. Each "Cause and Effects" entry describes the basic characteristics of the malfunction, what "Causes" the malfunction, and what the "Effects" of the malfunctions are for a given "Plant Status". The malfunction "Cause and Effect" descriptions are organized by plant system in alpha numeric order as shown by the index.

Based on the results of the completed Performance Test, the Millstone 1 Simulator has demonstrated excellent physical and functional fidelity when compared to the Millstone 1 reference plant. A comprehensive testing program has been performed to reach this conclusion and procedural controls are in place to ensure that the Millstone 1 Simulator retains the demonstrated fidelity.

The Performance Tests described in sections 2 through 9 were all performed by NRC licensed SROs or SRO certified instructors. Any deficiencies identified during the Performance Tests are identified in the attached Performance Test abstracts, including dates for resolution.

1. Testing Goals, Methodology and Assumptions

During the development and implementation of the Millstone 1 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 worthy of mention here:

- o Testing should be conducted during normal, abnormal and emergency conditions.
- o 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 result 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.
- o Any deficiencies found during testing which violate these criteria shall be documented by generating a Deficiency Report (DR), to be dispositioned in accordance with the NSEM.
- o The requirements of ANS 3.5 shall be implemented.

- All Simulator controls such as switches, annunciators, meters, controllers, recorders, lights, keylocks, pushbuttons, etc., should be tested.

- Former Millstone 1 operators should be used, if possible, for Normal Operations, System, and Malfunction testing.

- 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, Steam Line Break, etc.

- Two experienced observers should be used whenever possible to improve the observations made during testing.

- Acceptance Testing Procedure (ATP) documents should be used as a basis for certification testing procedures and expanded upon where necessary.

- Provisions for the re[illegible]ion of NSEM procedures shall be available. Changes to that manual will <u>not</u> be forwarded to the NRC unless they significantly alter the intent of the test program.

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

SYSTEM TESTS

- The plant process computer was being replaced during the testing phase and was not tested. It will be tested fully before official acceptance and will be tested as part of system tests thereafter.

- Digital plant process computer points need not be included on the Simulation Diagrams. Their absence improves the clarity of the diagrams.

NORMAL OPERATIONS TESTING

- 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 Train I Service Water Pump surveillance is performed, the Train II Service Water Pump surveillance need not be performed. Also, testing of surveillances which are strictly calculational is not required.

- The simulator's capability of performing a reactor trip followed by recovery to rated (full) power (ANS 3.5, Section 3.1.1, Item 4) may be tested by testing:

  - a plant startup to 100% power, followed by
  - a reactor trip, then
  - an increase in power to 15%

  There is no need to test the power ascension to 100% twice.

YEARLY OPERABILITY TESTING

STEADY STATE TESTING

- Application of both instrument error and allowed tolerance is to be made as follows. The ANS 3.5 allowed tolerance (Section 4.1(3) or (4)) is to be applied as a function of the reference plant indicated value above the minimum scale value. The allowable instrument error is to be a function of the instrument range, not its reference plant indicated value, when the instrument error is given as a percentage.
  For example:

  For a pressure instrument with a range of 1500 to 2500 psig, reading 2250 psig in the reference plant, the simulator accuracy, as indicated on the instrument, is expected to be:

  (2500-1500) (.01) + (2250-1500) (.02) = 25 psig

  This assumes an instrument accuracy of 1% and that this parameter is a critical parameter.

TRANSIENT TESTING

- All parameters required by ANS 3.5, Appendix B, B1.2 are to be tested at .5 second intervals.

- 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. Replotting of the transient is not required until the next scheduled yearly testing of the transient.

o Documenting the difference between the response of a simulator parameter and predicted reference plant response is not necessary for those differences of an obvious nature.

OTHER TESTING

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. System Tests

The Millstone 1 Simulator models 26 Plant Systems. A separate test was conducted for each of these Systems to ensure that all of the following operate correctly:

- Control Board Hardware such as handswitches, meters, controllers, recorders, indicating lights, keylocks and pushbuttons

- Annunciators

- Remote Functions (These are tasks performed by an instructor at the instructor station to simulate local actions; typically these are locally operated valves)

- Flowpaths, both normal and abnormal

- Process computer points will be tested during subsequent tests, but were not tested during the initial certification tests due to a concurrent plant process computer replacement.

NSEM Procedure 4.01 "Verifying Simulator Capabilities via System Tests" in Volume 2 of this submittal is the generic procedure which governs the writing and performance of System Tests. Attachment 8.1 of this procedure lists all 26 Millstone 1 Systems that are modeled. Examples of Millstone 1 Systems tested are: Service Water, Main Steam and Turbine.

The Turbine System Test has been provided in Attachment 1 as an example. Due to their large volume, the other 25 System Tests are not being transmitted. Abstracts of all 26 System Tests are contained in Attachment 2. The deficiencies found by these tests and still open are contained in each system test abstract. Refer to each system test abstract for details and dates for resolving these deficiencies.

Each simulated plant system has its own performance test to ensure:

- That all components of a specific system are checked at the same time for consistency.
- That a consistent set of performance requirements are applied to each system.
- That as Plant Design Changes are implemented, the System Test will act as a benchmark for proper system response.

The System Tests satisfy the requirements of ANS 3.5 Section 3.3. System Tests will be repeated over a four year interval as detailed in Section 13 of this summary. The System Tests are listed first in this performance test summary because their performance is a logical prerequisite to Normal Operations Testing, Surveillance Testing and Malfunction Testing.

Attachment 13 contains a list of all certified remote functions. All certified remote functions have been tested in the System Tests.

3. Normal Operations and Surveillance Testing

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), (7), (8) and (10) were performed using controlled copies of Millstone 1 Operating Procedures and Surveillances. ANS 3.5, Section 3.1.1 (9) was tested in the reactor core system test. NSEM Procedure 4.10, "Normal Operations Verification" (See Volume 2) contains the generic guidance used to write the Millstone 1 Simulator Normal Operations and Surveillance Test.

Attachment 3 contains the Millstone 1 Simulator test procedure used for Normal Operations and Surveillance testing. Using controlled copies of Millstone 1 Operating Procedures the following sequence of operations was tested on the Millstone 1 Simulator:

- The Simulator was initialized to Cold Shutdown conditions.
- A Nuclear Startup was performed.
- A Plant Heatup was performed.
- A Plant Startup was performed.
- A Load Increase to 100% power was performed.
- A Reactor Scram was initiated.
- A Reactor Scram recovery was performed.
- A Nuclear Startup was performed.
- A Plant Startup was performed.
- A Load Increase was performed (to 15% power).
- The Simulator was reinitialized to 100% power.
- A Plant Shutdown to hot standby was performed.
- A Reactor Shutdown was performed.
- A Plant Cooldown was performed until Cold Shutdown was reached.

The specific Millstone 1 Operating Procedure and Surveillance Procedure titles and numbers used h[illegible]st are listed in the individual steps of the test procedure shown in Attachment 3. Attachment 4 contains a concise list of 32 Surveillances that are available for use in Millstone 1 Simulator training.

Normal Operations and Surveillance Testing was performed from July 1988 to June 1990. In the course of the testing, seven deficiencies were identified and annotated in the procedure (Attachment 3). Three deficiencies had been previously documented:

Rod Worth Minimizer (resolved 6/25/90)	88-1-0064
Plant Process Computer	86-1-0342
SRM Initial Count Rate	88-1-0199

The remaining four (new) deficiencies are:

SRM/IRM Overlap	90-1-0032
SRM Indications	90-1-0035
IRM Chan. 12 Functional Test	90-1-0036
Valve Timing	90-1-0047

All Normal Operations and Surveillance Testing will be re-performed over a four-year interval as described in Section 13 of this document.

4. Malfunction Testing

ANSI/ANS 3.5 (1985) Section 3.1.2 requires 25 specific malfunctions to be available on a Simulator. The Millstone 1 Simulator is capable of all malfunctions that are applicable to BWRs.

The Millstone 1 Simulator is certified for 247 malfunctions. Volume 4 of this submittal contains an index of all malfunctions available on the Millstone 1 Simulator. Those malfunctions not certified are denoted in the list by an asterisk. This index is organized alpha-numerically by plant system. Attachment 14 contains a list of definitions for plant system abbreviations. Also contained in Volume 4 of this submittal for each malfunction is the malfunction "Cause and Effect". Each "Cause and Effect" description contains:

- o The malfunction description/title
- o Whether or not it is a variable malfunction
- o The "Cause" of the malfunction
- o The initial Plant Status that the malfunction "Effects" are written for
- o What the "Effects" of the malfunction are on plant operations
- o References showing where information was obtained

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

- o NSEM Procedure 4.04, Major Malfunction Testing (See Volume 2)
- o NSEM Procedure 4.05, Malfunction Testing (See Volume 2)

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

- o Millstone 1 Startup Test Program Results (G.E.)
- o Millstone 1 Updated Final Safety Analysis Report (UFSAR)
- o Millstone 1 Reference Plant Data Book
- o Cycle 13 Reload Analysis Report
- o LOCA Analysis Report for Millstone 1, G.E., July 1989

An example of a malfunction test written and conducted via the NSEM 4.04 process is contained in Attachment 12. The example in Attachment 12 is labeled "SW01, Loss of Service Water".

Malfunctions which do not cause large integrated plant effects or are very similar in response to a major malfunction 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 1 NRC licensed instructor 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 12. The example in Attachment 12 is labeled "AP01, APR/SRV Setpoint Incorrect".

In summary, each of the approximately 247 certified malfunctions has its own malfunction test procedure and its own "Cause and Effect" description. All of the "Cause and Effects" descriptions are included in Volume 4 of this submittal. Due to their large volume, only 2 malfunction test procedures are being provided in Attachment 12, as examples. Several additional volumes would be required if all the malfunction test procedures were to be submitted. 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 5 contains a cross reference of these 25 specific malfunctions to the applicable Millstone 1 Simulator malfunctions. Listed in Attachment 5 under each of the 25 ANS 3.5 required malfunctions are:

- o Abstracts from Millstone 1 Simulator malfunction tests providing:
  - The name of the malfunction
  - The date the test was performed
  - Whether the malfunction is variable, and if so, what its range is and what severity was tested
  - Starting conditions and end point conditions
  - The source of baseline or reference data
  - Details of identified deficiencies, if any, including dates for resolution

- o At the end of each of the 25 sections is a list of other Millstone 1 Simulator malfunctions which may meet the ANS 3.5 requirement, but for which no abstract is provided. Open deficiencies and a schedule for resolution is also provided.

Attachment 5 contains 53 malfunction test abstracts of the 247 certified Millstone 1 Simulator malfunctions. These 53 malfunction abstracts were chosen to cover the major malfunctions of interest (Loss of Instrument Air, Loss of Normal Power, etc.) and to cover at least one malfunction in each of the applicable ANS 3.5 malfunction types. The malfunction "Cause and Effect" descriptions (available in Volume 4 of this submittal) may be used as abstracts for other certified Millstone 1 Simulator malfunctions.

ANSI/ANS 3.5 (1985) Section 3.4.2 requires that provisions be available for incorporating additional malfunctions. As an example, malfunction RW02 and RW04 were added to the simulator due to changes in MP1 plant design.

All certified malfunctions will be retested over a four year interval, as described in Section 13 of this document.

5. 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 1 Simulator was written. This Millstone 1 specific test procedure is not contained in this submittal, but is available for review on request.

Initial Operability Testing was completed on the Millstone 1 Simulator in May 1990 and will be re-performed on an annual basis.

The Yearly Operability Testing consisted of the following items:

- Steady State Testing at 50% power, 80% power and 100% power

- Stability Testing at 100% power

- Transient Performance Testing for ten (10) transients

Reference Plant data obtained at 50%, 80% and 100% power during the various plant startups and power reductions 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 32 selected critical and non-critical points. These 32 points include all those listed in ANS 3.5 Section B1.1.

A Stability Test was performed at 100% power for approximately 32 points over a one hour period. This test was in conformance with ANS 3.5 Section B1.1.

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

The ten transients described in ANS 3.5 Section B1.2 were analyzed using the parameters indicated in ANS 3.5 Sections B1.2.1, 2, or 3, as appropriate. Attachment 10 contains abstracts of each of the ten transient tests. Transient testing was performed in December 19[illegible]3.

One deficiency was identified which affected more than one transient. Reactor water level response to the recirculation pump trip and maximum rate power ramp was slightly exaggerated. The magnitude of the error was not enough to measurably detract from training. This deficiency will be resolved by 6/30/92.

6. **Physical Fidelity**

ANSI/ANS 3.5 (1985) Sections 3.2 and 3.3.1 require sufficient panel and controls simulation to conduct normal operations and malfunction response. Further, the Simulator controls are required to duplicate the physical characteristics of the Reference Plant. In response to the issuance of 10 CFR 50.45, a two step evaluation process was emplo_ d for the existing Millstone 1 Simulator to ensure compliance with the ANS 3.5 Section 3.2 and 3.3.1 requirements.

The first step was verification that the existing Millstone 1 Simulator contained sufficient panels, controls and instrumentation to perform normal operations and respond to malfunctions. The second step was verification that the Millstone 1 Simulator panels and controls have physical fidelity with the Reference Plant. These two steps in the Physical Fidelity evaluation are summarized below, as sections A and B.

A. The Millstone 1 Simulator was constructed prior to the issuance of 10 CFR 55.45. NU considered it appropriate to conduct a review of the adequacy of the Simulator to meet the needs of licensed operators in performing normal operations and responding to malfunctions. This review process was governed by the following two procedures:

   - o NSEM Procedure 2.01, "Defining Training Requirements"
   - o NSEM Procedure 2.02, "Defining the Certified Trainer"

   Utilizing the above procedures, a systematic review was conducted of all tasks contained within the Simulator Training Guides <u>and</u> all ANS 3.5 requirements in order to compile a comprehensive list of:

   - o All required control board hardware (control board switches, meters, controllers, etc.) needed for Simulator Training

- All required software flowpaths, both normal and abnormal, needed for Simulator Training

- All remote functions (locally operated valves, etc.) needed for Simulator Training

- All malfunctions needed for Simulator Training

The Simulator Training Guides utilized in this process were developed using a Systematic Approach to Training. The few identified deficiencies resulting from this systematic review have been documented. The documentation of this systematic review is not in this submittal, but is available for review, upon request.

The small number of deficiencies identified by this process confirmed the adequacy of the decision-making process used for the initial Millstone 1 Simulator design. This systematic review as defined in NSEM Procedures 2.01 and 2.02 was a one-time process to verify the adequacy of the scope of simulation to support training. The Training Department receives sufficient notification of procedure changes, LERs, Plant Design Changes, etc., to ensure that training programs and the Millstone 1 Simulator are modified to keep pace with Reference Plant changes.

B. The next step was to compare the Reference Plant and Simulator Control Rooms for physical fidelity. 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 August 1989 and compared to the Simulator in September 1989. Five deficiencies that could potentially affect training were identified. These items were primarily concerned with identification markings for keylock switches, escutcheons, annunciators and plant instrumentation. DRs 89-1-0198 and 89-1-0199 pertaining to switch and escutcheon markings have been corrected.

The remaining deficiencies regarding tagging and annunciators, are being resolved as time permits; they do not adversely affect simulator training. Those differences between the Simulator and Reference Plant Control Room which have been dispositioned as "not affecting training" are described in Attachment 11, labeled "Physical Fidelity Report". To ensure continued physical fidelity, photographs will be taken annually for reference plant control boards that have undergone changes.

NU has a strong commitment to maintain the Millstone 1 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.

7. Initial Conditions Testing

Initial Conditions Testing was performed in April 1990. NSEM Procedure 4.02, "Initial Conditions", describes this process. The Millstone 1 Simulator has capabilities for storing 58 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. Attachment 6 contains the checklist used for reviewing all certified ICs. The number of certified ICs may vary between 10 and 58, depending on simulator training requirements. Ten ICs have been designated as the "base" group of ICs that will be maintained certified. These 10 certified ICs cover a broad range of conditions such as:

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

Only certified ICs are used for training or exams. Attachment 6 also lists the "base" group of 10 certified ICs. Listed in Attachment 6 for each of the ICs is the following:

- o MWE
- o Pressure (psig)/temperature (deg F)
- o Reactor Power (%)
- o Xenon Reactivity
- o Date/Time when the IC was last modified
- o Remarks section which describes the basic conditions of the IC
- o Core flow
- o Core life

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

8. Simulator Operating Limits Testing

Simulator Operating Limits Testing was performed between November 1988 and May 1990. The purpose of this testing was to identify any areas of possible negative training and to take actions to prevent such negative training. 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: a) freezing the simulator and, b) administrative controls. The Reference Plant design limits and/or Simulator model limits which cause the Simulator to "freeze" are listed below.

Administrative Simulator Operating Limits are controlled by the simulator instructor. These administrative limits are implemented through simulator instructor training and cautions placed in those Simulator Guides where such situations could occur. Presently, the Millstone 1 Simulator has no administrative operating limits. Should the need arise, administrative operating limits will be implemented per NSEM 4.08.

The Millstone 1 Simulator will go to "freeze" if any of the following conditions exist:

-	RCS Pressure	1800 psig
-	Containment Pressure	100 psig
-	Fuel Power	22 KW/FT
-	Fuel Clad Temp	2200° 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 instructor station.

9. Instructor Station Testing

Between August and November 1988, 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 1 Instructor Station:

- o Backtrack
- o Fastime, for each of the six (6) modeled Fastime parameters
- o Slowtime
- o Boolean Trigger
- o Composite Malfunction
- o Variable Parameter Control
- o Freeze
- o Snapshot

To verify the I/O override feature of the Millstone 1 Simulator, a small number of the following points were tested to verify proper operation.

- o Analog Outputs
- o Analog Inputs
- o Digital Inputs
- o Digital Outputs
- o "Crywolf" Annunciator feature
- o 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 1 simulator has the ability to I/O override essentially every point in the simulator. While this is a great capability, there are therefore thousands of I/O override points. 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.

10. Real Time Testing

Real Time Testing was performed in December 1989, per NSEM procedure 4.13, "Real Time Simulator Verification".

The purpose of this test was to verify that all simulation models are running in real time. Verification was accomplished by:

- o Monitoring the operations of the internal Computer Clock and Interrupt Timers and comparing them against the vendor's specifications.

- o Ensuring that the spare time remaining in the simulation computer for each of the following complex scenarios was > 10%:
  - ATWS (stuck rods)
  - Turbine load reject/trip
  - Steam-Line Break
  - Loss of Coolant Accident
- o Installing software counters in the Reactor Core, RCS and Feedwater models and comparing their actual values to expected values for each of the above scenarios.

The results of these tests show that the Millstone 1 Simulator performs in real time. In addition, an internal software timer continuously monitors computer usage and will automatically bump out any task that slips two consecutive frames.

No deficiencies were identified. This test will be repeated once every four years or at any time a question exists that the Millstone 1 Simulator is not running in real time.

11. Ensuring Continuing Performance of the MP1 Simulator

To ensure that the MP1 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 1 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

All 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.

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 7 contains the results of the survey performed in February and March 1990. The summary letter also contains the disposition of action to be taken for each item. The few items indicated as open requiring further investigation will be investigated during 1990.

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 1 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:

- o Adding or deleting remote functions
- o Adding or deleting malfunctions
- o Changing remote functions or malfunctions
- o 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 report date, or upon NRC request.

12. Open Deficiency Report (DR) List

Attachment 8 contains a current listing of all Millstone 1 simulator open Deficiency Reports (DRs). This list contained 245 open DRs as of June 26, 1990.

DRs have been placed into three categories, based on their importance. The three categories are Category A, B and C. Please refer to Attachment 8 of this volume for the specific numbers and titles of the various DRs.

Category A:

This category includes 203 DRs listed as Priority 2 in Attachment 8. These DRs are categorized as Priority 2 based on their significance as defined in Volume II of this submittal. 202 of the 203 DRs listed will be dispositioned[1] by 6/30/92.

The remaining DR, 86-1-0342, was written to replace the Plant Process Computer (PPC) on the MP1 Simulator to reflect modifications made to the reference plant. Currently all of the required PPC hardware has been installed on the Simulator and work is ongoing to modify the vendor software to operate in a simulation environment.

The effort to replace the PPC in the Simulator was initiated in conjunction with the start of the replacement project in the reference plant. Completion of this DR has been delayed for the following reasons:

- Procurement of vital hardware (smart terminals) was delayed because of a U. S. Government embargo on Toshiba products.

- Limited availability of necessary corporate and in-house PPC software and operational expertise.

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.

- o Significant increases in the software work scope as a result of changes made to the reference plant PPC design.

- o Magnitude and complexity of the software modifications needed to adapt the vendor software from the plant environment to the simulator.

NU fully expects to disposition[1] this DR by 12/31/90.

<u>Category B</u>: These DRs will be dispositioned by 6/30/93. This category includes 42 DRs listed as priority 3 in Attachment 8. These DRs are categorized [illegible]rity 3 based upon their significance described in Volume II [illegible] submittal.

<u>Category C</u>: These DRs will be dispositioned as time permits. Millstone 1 has no DRs in this category.

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. Next 4-Year Schedule. (July 1990 to June 1994)

The entire MP1 performance test will be repeated over a four-year interval as described in Attachment 9. The schedule shown in Attachment 9 has been written based on the guidance provided in NSEM Procedure 4.07, "Master Test Schedule". This 4-year interval will start on the date of this submittal.

The following tests must be performed each year:

- Annual Operability Testing
- Physical Fidelity Verification

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

- Normal Plant Evolutions and Surveillance T... ng
- All System Tests
- All Certified Malfunctions
- Instructor Station Testing
- Real Time Testing

ATTACHMENT 1

MP1 TURBINE SYSTEM TEST

This attachment is referenced by Section 2
of the Performance Test Summary

Figure 7.1

SIMULATOR SYSTEM TEST COVER SHEET

SYSTEM TITLE Turbine

ATTACHMENT 8.1.21 REV. 0
Unit - Sys

UNIT 1

Chris Tabone
Developed By

08/26/88
Date

M.C. Jensen
Released for Testing By
Assistant Supervisor
Operator Training (ASOT)

8/29/88
Date

Remarks:

Test Performed by
Date 09/02/88
Comments Attached Y ___ N ✓

Test Verified by
Date 4/10/90
Comments Attached Y ___ N ✓

System Test Accepted by M.C. Jensen (ASOT)
Date 5/7/90

Rev.: 0
Date: 05/04/88
Page: 7.1-1 of 1

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: TURBINE AND PRESSURE CONTROL
TEST INDEX NUMBER : 8.1.13
TEST TITLE: SYSTEM STARTUP AND COLD TESTING

DATE: September 12, 198
PAGE: 1
REV: 0
NO: 4660

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D

#466100, SYSTEM STARTUP AND COLD TESTING
TURBINE AND PRESSURE CONTROL

THIS TEST FIRST ATTEMPTS TO RESET THE VARIOUS TURBINE TRIPS WITHOUT SUFFICIENT OIL PRESSURE, THEN WITH THE AUXILIARY OIL PUMPS RUNNING.

THE BYPASS VALVES ARE TESTED INDIVIDUALLY. VACUUM TRIP #1 AND THE EMERGENCY GOVERNOR ARE RESET AND THE INTERMEDIATE STOP VALVES, INTERCEPT VALVES, AND TURBINE STOP AND CONTROL VALVES ARE OPENED. THEN VACUUM TRIP #2 IS RESET AND THE BYPASS VALVES ARE OPENED.

ANNUNCIATORS:

905A2(6-4)
907A1(1-5)
907A1(1-7)
907A1(3-7)
907[illegible]2)
907[illegible]6)
907A2(3-5)

PPC POINTS:

TGT694
TGT696
TGT698
TGT700
TUR705
TGT702
TGT538

466101 RESET TO IC-3 -PCM- IC-3

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	READY FOR STARTUP, 170 DEG., MODE SWITCH IN SHUTDOWN, MOC.			
	TURBINE ON TURNING GEAR WITH TURNING GEAR OIL PUMP RUNNING.			
466102	PLACE THE VACUUM TRIP #1 RESET SWITCH TO RESET.	907	CS-71	
	SPRING RETURN TO OFF.			
	AMBER RESET LIGHT COMES ON.	907	CS-71-1	
	AMBER VACUUM TRIP LIGHT GOES OFF.	907	CS-71-2	
466103	RELEASE THE RESET SWITCH.	907	CS-71	
	AMBER VACUUM TRIP LIGHT COMES ON.	907	CS-71-2	
	AMBER RESET LIGHT GOES OFF.	907	CS-71-1	
466104	PLACE THE EMERG GOVERNOR TRIP TEST SWITCH TO LOCKOUT, RESET, AND TEST TRIP, THEN RETURN IT TO OFF.	907	CS-73	
	MAINTAINED IN OFF AND LOCKOUT, SPRING RETURN TO LOCKOUT FROM RESET AND TEST TRIP.			
	RED TRIPPED LIGHT REMAINS ON.	907	ETL	
	NO OTHER INDICATIONS CHANGE.			
466105	PLACE THE VACUUM TRIP #2 RESET SWITCH TO RESET.	907	CS-72	
	SPRING RETURN TO OFF.			
	AMBER RESET LIGHT COMES ON.	907	CS-72-1	

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	AMBER VACUUM TRIP LIGHT GOES OFF.	907	CS-72-3	
466106	RELEASE THE RESET SWITCH.	907	CS-72	
	AMBER RESET LIGHT GOES OFF.	907	CS-72-1	
	AMBER VACUUM TRIP LIGHT COMES ON.	907	CS-72-3	
466107	PRESS INDIVIDUALLY, THEN TOGETHER THE MANUAL VACUUM TRIP #1 BUTTONS.	907	PB-56A PB-56B	
	NOTHING HAPPENS WHEN PRESSED INDIVIDUALLY.			
	MAIN TRIP SLND 3 (TRIP AS LONG AS BOTH BUTTONS ARE PRESSED.	-PPC-	TGT696	
	THIS PPC POINT ONLY INDICATES BUTTON STATUS, NOT TRIP STATUS)			
466108	PRESS INDIVIDUALLY, THEN TOGETHER THE MANUAL VACUUM TRIP #2 BUTTONS.	907	PB-58A PB-58B	
	NOTHING HAPPENS WHEN PRESSED INDIVIDUALLY.			
	MAIN TRIP SLND 2 (TRIP AS LONG AS BOTH BUTTONS ARE PRESSED.	-PPC-	TGT694	
	THIS PPC POINT ONLY INDICATES BUTTON STATUS, NOT TRIP STATUS)			
466109	HOLD THE LOAD LIMIT MOTOR SWITCH SWITCH IN LOWER FOR ABOUT 30 SEC, THEN IN RAISE FOR 10 SEC.	907	CS-61	
	NO INDICATIONS CHANGE.			
466110	PLACE THE SPEED LOAD CHANGER TO RAISE.	907	CS-60	

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/I
	SPRING RETURN TO OFF.			
	SPEED LOAD CHANGER POSITION INCREASES TO 107% IN 100 SEC AND STOPS.	907	EI-SLC	
	GREEN 95% LOW SPEED MECH STOP GOES OFF.			
	RED 107% HI SPEED LIMIT SW LIGHT COMES ON.	907	CS-60-1	
466111	PRESS THE 107% OVERRIDE BUTTON.	907	PB-60B	
	SPEED LOAD CHANGER POSITION INCREASES ONLY WHILE BUTTON IS PRESSED, BUT STOPS AT 111%			
	GOV HI SPEED MECH STOP 111% LIGHT COMES ON.			
466112	PLACE THE SPEED LOAD CHANGER TO LOWER.	907	CS-60	
	SPEED LOAD CHANGER POSITION DECREASES TO 95%.	907	EI-SLC	
	GOV HI SPEED MECH STOP 111% LIGHT GOES OFF.			
	RED 107% HI SPEED LIMIT SW LIGHT GOES OFF.	907	CS-60-1	
	GREEN 95% LOW SPEED MECH STOP COMES ON.			
466113	PLACE THE BACKUP OVERSPEED SETDOWN SWITCH TO SETDOWN.	907	CS-60A	
	SPRING RETURN TO NORM.			
	GREEN TRIP SET 112% LIGHT GOES			

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1 DATE: September 12, 19[illegible]
SYSTEM TITLE: TURBINE AND PRESSURE CONTROL PAGE: 5
TEST INDEX NUMBER : 8.1.13 REV: 0
TEST TITLE: SYSTEM STARTUP AND COLD TESTING NE: 4660

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	OFF.			
	AMBER TRIP SETDOWN TO 109% LT COMES ON.			
466114	RELEASE THE SETDOWN SWITCH.			
	AMBER TRIP SETDOWN TO 109% LT GOES OFF.			
	GREEN TRIP SET 112% LIGHT COMES ON.			
466115	PLACE THE #2 TURBINE STOP VALVE INTERNAL BYPASS VALVE SWITCH TO RAISE SLOW FOR 150 SEC.	907	CS-62	
	5-POS, SPRING RETURN TO OFF.			
	RED NOT CLOSED LIGHT COMES ON IMMEDIATELY.			
	GREEN TRANSFER POINT LIGHT COMES ON AFTER 120 SEC.			
	NO OTHER INDICATIONS CHANGE.			
466116	PLACE THE #2 TURBINE STOP VALVE INTERNAL BYPASS VALVE SWITCH TO LOWER SLOW.	907	CS-62	
	GREEN TRANSFER POINT LIGHT GOES OFF IMMEDIATELY.			
	RED NOT CLOSED LIGHT GOES OFF AFTER 120 SEC.			
466117	PLACE THE #2 TURBINE STOP VALVE INTERNAL BYPASS VALVE SWITCH TO RAISE FAST FOR 30 SEC.	907	CS-62	
	RED NOT CLOSED LIGHT COMES ON			

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	IMMEDIATELY.			
	GREEN TRANSFER POINT LIGHT COMES ON AFTER 20 SEC.			
	NO OTHER INDICATIONS CHANGE.			
466118	PLACE THE #2 TURBINE STOP VALVE INTERNAL BYPASS VALVE SWITCH TO LOWER FAST.	907	CS-62	
	GREEN TRANSFER POINT LIGHT GOES OFF IMMEDIATELY.			
	RED NOT CLOSED LIGHT GOES OFF AFTER 20 SEC.			
466119	PLACE THE #2 TURBINE STOP VALVE INTERNAL BYPASS VALVE SWITCH TO RAISE FAST FOR 5 SEC.	907	CS-62	
	RED NOT CLOSED LIGHT COMES ON IMMEDIATELY.			
466120	PLACE THE BYPASS VALVE OPENING JACK SWITCH TO LOWER.	907	CS-63	
	SPRING RETURN TO OFF.			
	JACK INDICATES FULL OPEN IN 1 MIN 15 SEC.			
	METER INDICATES JACK POSITION.	907	EI-BOJ	
	EPR AND MPR CONTROL LIGHTS GO OFF.	907	CS-62-3 CS-62-2	
	NO OTHER INDICATIONS CHANGE.			
466121	CLOSE THE BYPASS VALVE OPENING JACK.			

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	EPR AND MPR CONTROL LIGHTS COME ON.	907	CS-62-3 CS-62-2	
466122	PLACE THE MPR SETPOINT CONTROL SWITCH TO RAISE.	907	CS-65	
	SPRING RETURN TO OFF.			
	SETPOINT INCREASES FROM 150 TO 1050 PSIG AT 1 PSI/SEC.			
	PRESS REG OUTPUT STROKE REMAINS AT 0%.	907	EI-RS	
466123	RETURN THE MPR SETPOINT TO 150.			
466124	PLACE THE EPR SETPOINT CONTROL TO RAISE FOR 5 SEC.	907	CS-49	
	SPRING RETURN TO OFF.			
	NO INDICATIONS CHANGE.			
466125	PLACE THE EPR POWER SWITCH IN ON.	907	CS-MT-1	
	2-POSITION, MAINTAINED CONTACTS			
	EPR SERVO POSITION INDICATION REMAINS AT 100%.	907	EI-EPR	
	EPR SETPOINT INDICATION READS AT 1010 PSIG.	907	EI-PLP	
466126	PLACE THE EPR SETPOINT CONTROL TO LOWER.	907	CS-49	
	EPR SETPOINT DECREASES TO 910 PSIG AT 1 PSI/SEC.	907	EI-PLP	
466127	PLACE THE EVEN NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN POSITION 2.	923	CS-51A	

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	6-POSITION, MAINTAINED CONTACTS			
466128	PLACE THE BYPASS VALVE TEST SWITCH IN TEST A.	923	CS-51C	
	SPRING RETURN TO NORMAL.			
	NO INDICATIONS CHANGE.			
466129	RELEASE THE TEST SWITCH.			
466130	START THE AUXILIARY OIL PUMPS.	907	CS-95	
	HYDRAULIC OIL PRESSURE INCREASES TO ABOUT 195 PSIG.			
	TURB HYD OIL PRESS (NORM ABOVE 190 PSIG)	-PPC-	TUR705	
	TURB TRIP OVER SPEED (RESET WHEN OIL PRESSURE IS AVAILABLE THROUGH THE BACKUP OVERSPEED GOVERNOR.)	-PPC-	TGT702	
466131	PLACE THE CONDENSER SPRAY VALVE SWITCH IN OPEN.	923	CS-355	
	3-POSITION, MAINTAINED.			
	RED LIGHT INDICATES VALVE OPEN.			
466132	PLACE THE CONDENSER SPRAY VALVE SWITCH IN AUTO.			
	VALVE CLOSES.			
	NOTE: IN THE FOLLOWING STEPS THE BYPASS VALVES SHOULD STROKE OPEN IN 11-21 SEC, AND STROKE CLOSED IN 8-13 SEC.			

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1 DATE: September 12, 198
SYSTEM TITLE: TURBINE AND PRESSURE CONTROL PAGE: 9
TEST INDEX NUMBER : 8.1.13 REV: 0
TEST TITLE: SYSTEM STARTUP AND COLD TESTING NE: 4660

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
466133	PLACE THE BYPASS VALVE TEST SWITCH IN TEST A.	923	CS-51C	
	VA #2 LIGHTS INDICATE VALVE OPENS.	923	CS-51B-2	
	BYPASS VALVE #2 POSITION INCREASES TO 100%.	907 923	EI-BV-6 EI-BV-6A	
	CONDENSER SPRAY VALVE OPENS WHEN BV #2 OPEN LIGHT COMES ON.	923	CS-355	
466134	RELEASE THE TEST SWITCH.			
	VALVE CLOSES.			
	CONDENSER SPRAY VALVE CLOSES.	923	CS-355	
466135	PLACE THE EVEN NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN POSITION 4.	907	CS-51A	
466136	PLACE THE BYPASS VALVE TEST SWITCH IN TEST B.	923	CS-51C	
	NOTHING HAPPENS.			
466137	PLACE THE BYPASS VALVE TEST SWITCH IN TEST A.	923	CS-51C	
	VA #4 LIGHTS INDICATE VALVE OPENS.	923	CS-51B-4	
	"TURBINE BYPASS VALVES OPEN/LOAD REJ BYPASS" ALARM (ACTUATES)	ANN	905A2(8-2)	
	TURBINE BYPASS OPEN LOAD REJECT BYPASS RPS RELAY OFF WHEN BV #4 HAS OPENED 10%.	915	590-122A	
466138	PLACE THE EVEN NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN	907	CS-51A	

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/
	POSITION 6.			
	VA #6 LIGHTS INDICATE VALVE OPENS. WHILE BV #4 IS CLOSING.	923	CS-51B-6	
	TURBINE BYPASS OPEN LOAD REJECT BYPASS RPS RELAY OFF WHEN BV #6 HAS OPENED 10%.	917 ANN	590-122B 905A2(8-2)	
	TURBINE BYPASS OPEN LOAD REJECT BYPASS RPS RELAY ON WHEN BV #4 HAS CLOSED TO 10%.	915	590-122A	
466139	PLACE THE EVEN NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN POSITION 8.	907	CS-51A	
	VA #8 LIGHTS INDICATE VALVE OPENS. WHILE BV #6 IS CLOSING.	923	CS-51B-8	
	TURBINE BYPASS OPEN LOAD REJECT BYPASS RPS RELAY ON WHEN BV #6 HAS CLOSED TO 10%.	917	590-122B	
466140	PLACE THE EVEN NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN POSITION 10.	907	CS-51A	
	VA #10 LIGHTS INDICATE VALVE OPENS. WHILE BV #8 IS CLOSING.	923	CS-51B-10	
	BYPASS VALVES GREEN CLOSED INDICATING LIGHT GOES OFF WHEN BV #10 IS FULLY OPEN.	907	BVS	
466141	RELEASE THE BYPASS VALVE TEST SWITCH TO OFF.	923	CS-51C	
	VA #10 CLOSES.			

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT
	BYPASS VALVES GREEN CLOSED INDICATING LIGHT COMES ON WHEN BV #10 STARTS TO CLOSE.	907	BVS	
466142	PLACE THE EVEN NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN OFF.	907	CS-51A	
466143	PLACE THE ODD NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN POSITION 1.	907	CS-51B	
	6-POSITION, MAINTAINED CONTACTS			
466144	PLACE THE BYPASS VALVE TEST SWITCH IN TEST B.	923	CS-51C	
	VA #1 LIGHTS INDICATE VALVE OPENS.	923	CS-51B-1	
	BYPASS VALVE #1 POSITION INCREASES TO 100%.	907 923	EI-BV-1 EI-BV-1A	
	CONDENSER SPRAY VALVE OPENS WHEN BV #1 OPEN LIGHT COMES ON.	923	CS-355	
	BYPASS VALVES RED INDICATING LIGHT COMES ON WHEN BV #1 STARTS TO OPEN.	907	BVS	
466145	RELEASE THE TEST SWITCH.			
	VALVE CLOSES.			
	CONDENSER SPRAY VALVE CLOSES.	923	CS-355	
	BYPASS VALVES RED INDICATING LIGHT GOES OFF WHEN BV #1 IS FULLY CLOSED.	907	BVS	
466146	PLACE THE ODD NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN POSITION 3.	907	CS-51B	

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: TURBINE AND PRESSURE CONTROL
TEST INDEX NUMBER : 8.1.13
TEST TITLE: SYSTEM STARTUP AND COLD TESTING

DATE: September 12, 19
PAGE: 12
REV: 0
NE: 660

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/
466147	PLACE THE BYPASS VALVE TEST SWITCH IN TEST A.	923	CS-51C	
	NOTHING HAPPENS.			
466148	PLACE THE BYPASS VALVE TEST SWITCH IN TEST B.	923	CS-51C	
	VA #3 LIGHTS INDICATE VALVE OPENS.	923	CS-51B-3	
	TURBINE BYPASS OPEN LOAD REJECT BYPASS RPS RELAY OFF WHEN BV #3 HAS OPENED 10%.	915 ANN	590-122C 905A2(8-2)	
466149	PLACE THE ODD NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN POSITION 5.	907	CS-51B	
	VA #5 LIGHTS INDICATE VALVE OPENS. WHILE BV #3 IS CLOSING.	923	CS-51B-5	
	TURBINE BYPASS OPEN LOAD REJECT BYPASS RPS RELAY OFF WHEN BV #5 HAS OPENED 10%.	917 ANN	590-122D 905A2(8-2)	
	TURBINE BYPASS OPEN LOAD REJECT BYPASS RPS RELAY ON WHEN BV #3 HAS CLOSED TO 10%.	915	590-122C	
466150	PLACE THE ODD NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN POSITION 7.	907	CS-51B	
	VA #7 LIGHTS INDICATE VALVE OPENS. WHILE BV #5 IS CLOSING.	923	CS-51B-7	
	TURBINE BYPASS OPEN LOAD REJECT BYPASS RPS RELAY ON WHEN BV #5 HAS CLOSED TO 10%.	917	590-122D	
466151	PLACE THE ODD NUMBERED BYPASS	907	CS-51B	

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT.
	VALVE TEST SELECTOR SWITCH IN POSITION 9.			
	VA #9 LIGHTS INDICATE VALVE OPENS. WHILE BV #7 IS CLOSING.	923	CS-51B-9	
466152	PLACE THE ODD NUMBERED BYPASS VALVE TEST SELECTOR SWITCH IN OFF.	907	CS-51B	
	NOTE: THE BYPASS VALVE TESTING MECHANISM DOES NOT REQUIRE ANY TRIPS TO BE RESET.			
466153	PLACE THE VACUUM TRIP #1 RESET SWITCH TO RESET.	907	CS-71	
	AMBER RESET LIGHT COMES ON.	907	CS-71-1	
	AMBER VACUUM TRIP LIGHT GOES OFF.	907	CS-71-2	
466154	RELEASE THE RESET SWITCH.	907	CS-71	
	AMBER RESET LIGHT GOES OFF.	907	CS-71-1	
466155	ATTEMPT TO LATCH AND OPEN SV #2.			
	VALVE WILL NOT LATCH.			
466156	PLACE THE EMERG GOVERNOR TRIP TEST SWITCH TO LOCKOUT.	907	CS-73	
	AMBER LOCKOUT LIGHT COMES ON.	907	CS-73A	
	TURBINE EMERGENCY TRIP LOCKED OUT (ACTUATES)	-ANN-	907A1(2-7)	
466157	PLACE THE EMERG GOVERNOR TRIP TEST SWITCH TO RESET.	907	CS-73	
	RED TRIPPED LIGHT GOES OFF.	907	ETL	

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1 — DATE: September 12, 1993
SYSTEM TITLE: TURBINE AND PRESSURE CONTROL — PAGE: 14
TEST INDEX NUMBER : 8.1.13 — REV: 0
TEST TITLE: SYSTEM STARTUP AND COLD TESTING — NE: 4660

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	AMBER EMERG TRIP LIGHT GOES OFF	907	CS-71-3	
	TURBINE OVERSPEED TRIP (CLEARS) EMERG SWCH TRIP (RESET)	-ANN- -PPC-	907A1(1-5) TGT700	
	TURB TRIP OVERSPEED (NORM)	-PPC-	TGT538	
	INTERMEDIATE STOP VALVES OPEN FULLY IN 10-12 SEC.	923	EI-ISV-1 EI-ISV-2 EI-ISV-3 EI-ISV-4	
	VALVE INDICATING LIGHTS SHOW INTERMEDIATE, THEN OPEN.	923	CS-55-1 CS-55-2 CS-55-3 CS-55-4	
	HP, IP, AND LIP HEATER REVERSE CURRENT VALVES OPEN.	923	CS-405A CS-405B CS-406B	
	8TH, 9TH, AND 11TH STAGE XSTM TO COND VALVES CLOSE.	923	LCV-1-9 LCV-1-5 LCV-1-1	
	TURBINE EMERGENCY OIL PRESSURE TRIP (WILL NEVER ACTUATE. PS-23 DISCONNECTED ON CWD 70, REV. 11)	-ANN-	907A1(1-7)	
466158	PLACE THE EMERG GOVERNOR TRIP TEST SWITCH TO TEST TRIP.	907	CS-73	
	EMERG GOV TRIP (TRIP THEN RSET AS OIL TRIP PRESSURE INCREASES)	-PPC-	TGT698	
	NOTE: SINCE TURBINE IS NOT NEAR RATED SPEED, THE TEST TRIP WILL NOT ACTUATE THE EGT.			
466159	PLACE THE EMERG GOVERNOR TRIP TEST SWITCH TO OFF.	907	CS-73	

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT
	LOCKOUT LIGHT GOES OFF.	907	CS-73A	
	GREEN RESET LIGHT COMES ON.	907	LVL	
466160	PLACE THE #2 TURBINE STOP VALVE INTERNAL BYPASS VALVE SWITCH TO LOWER SLOW OR FAST UNTIL THE NOT CLOSED LIGHT GOES OFF.	907	CS-62	
	GREEN UNLATCHED LIGHT GOES OFF.			
466161	PLACE THE #2 TURBINE STOP VALVE INTERNAL BYPASS VALVE SWITCH TO RAISE FAST FOR 20 SEC.	907	CS-62	
	RED NOT CLOSED LIGHT COMES ON IMMEDIATELY.			
	SV #2 POSITION INCREASES TO 10% IN 20 SEC.			
	STOP VALVE LIGHTS INDICATE INTERMEDIATE WHILE ANY SV IS INTERMEDIATE.	907	SVS	
	GREEN TRANSFER POINT LIGHT COMES ON.			
	SV #2 POSITION INCRESES TO 100% IN 14-18 SEC.			
	SV #1, 3 & 4 POSITION INDICATIONS INCREASES TO 100% IN 40 SEC. AS SOON AS SV #2 OPENS TO 40%.			
	TURBINE STOP VALVE CLOSURE RPS RELAYS ON WHEN SV #2 OPENS MORE THAN 90%.	915 917	590-124C 590-124F	
	TURBINE STOP VALVE CLOSURE RPS	915	590-124A	

CERTIFICATION SYSTEM TEST

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	RELAYS ON WHEN SV #1, 3, AND 4 OPEN MORE THAN 90%. (DETAILED LOGIC TO BE CHECKED LATER.)	917	590-124E 590-124G 590-124B 590-124D 590-124H	
	TURBINE STOP VALVE CLOSURE (CLEARS)	-ANN-	905A2(6-4)	
466162	PLACE THE EXHAUST HOOD SPRAY VALVE SWITCH IN AUTO.	907	CS-85A	
	RED LIGHT COMES ON INDICATING PRESSURE TO THE SPRAY HEADER.			
	TURBINE EXHAUST HOOD WATER SPRAY OPERATING (ACTUATES)	-ANN-	907A1(3-2)	
466163	PLACE THE LOAD LIMIT MOTOR SWITCH TO LOWER.	907	CS-61	
	LATCHED LIGHT COMES ON AFTER 10 SEC.	907	CS-61-1	
466164	RUN BYPASS VALVE OPENING JACK ALL THE WAY UP.			
466165	PLACE THE LOAD LIMIT MOTOR SWITCH TO RAISE.			
	LOAD LIMIT INCREASES TO 100% IN 30 SEC.	907	EI-LL	
	INTERCEPT VALVES BEGIN TO OPEN IMMEDIATELY AND ARE FULLY OPEN WHEN LOAD LIMIT REACHES 32%.	907	IVS	
	INTERCEPT VALVE POSITION METERS RESPOND.	923	EI-IV-1 EI-I-2 EI-IV-3 EI-IV-4	

CERTIFICATION SYSTEM TEST

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/
	INTERCEPT VALVE POSITION LIGHTS RESPOND.	923	CS-66-1 CS-66-2 CS-67-3 CS-67-4	
	CONTROL VALVE #1 BEGINS TO OPEN AT 21% LOAD LIMIT AND IS FULLY OPEN AT 98% LOAD LIMIT.	923	EI-CV-1	
	LOAD LIMIT/VLVS CLOSED LIGHT GOES OFF.	907	CS-61-2	
	CONTROL VALVE #2 BEGINS TO OPEN AT 24% LOAD LIMIT AND IS FULLY OPEN AT 98% LOAD LIMIT.	923	EI-CV-2	
	CONTROL VALVE #3 BEGINS TO OPEN AT 24% LOAD LIMIT AND IS FULLY OPEN AT 98% LOAD LIMIT.	923	EI-CV-3	
	CONTROL VALVE #4 BEGINS TO OPEN AT 24% LOAD LIMIT AND IS FULLY OPEN AT 98% LOAD LIMIT.	923	EI-CV-4	
	EXHAUST HOOD SPRAY FLOW INDICATING LIGHT GOES OFF ABOVE 15% CONTROL VALVE POSITION.	907	CS-85A	
	TURBINE EXHAUST HOOD WATER SPRAY OPERATING (CLEARS)	-ANN-	907A1(3-2)	
466166	CLOSE THE CONTROL VALVES WITH THE LOAD LIMIT MOTOR SWITCH.	907	CS-61	
466167	RUN BYPASS VLV OPENING JACK BACK TO 0.			
466168	PLACE THE VACUUM TRIP #2 RESET SWITCH TO RESET.	907	CS-72	
	SPRING RETURN TO OFF.			

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	AMBER RESET LIGHT COMES ON.	907	CS-72-1	
	AMBER VACUUM TRIP LIGHT GOES OFF.	907	CS-72-3	
466169	RELEASE THE RESET SWITCH.	907	CS-72	
	AMBER RESET LIGHT GOES OFF.	907	CS-72-1	
466170	PLACE THE BYPASS VALVE OPENING JACK SWITCH TO RAISE.	907	CS-63	
	METER INDICATES JACK POSITION.	907	EI-BOJ	
	BYPASS VALVE POSITION RECORDER FOLLOWS JACK POSITION.	907	R49	
	TURBINE BYPASS VALVES OPEN (ACTUATES WHEN RECORDER EXCEEDS 20%.)	-ANN-	907A2(3-5)	
	BYPASS VALVES OPEN IN NUMERICAL SEQUENCE, EACH REACHING FULL OPEN AT 10% INTERVALS.			
	BYPASS VALVE #1 POSITION INCREASES TO 98%, THEN #2 POSITION BEGINS INCREASING.	907 923	EI-BV-1 EI-BV-6 EI-BV-1A EI-BV-6A	
	BYPASS VALVES INDICATING LIGHTS INDICATE INTERMEDIATE WHEN #1 BEGINS TO OPEN, AND FULL OPEN WHEN #10 REACHES FULL OPEN.	907	BVS	
466171	PRESS BOTH VACUUM TRIP #2 BUTTONS.	907	PB-58A PB-58B	
	AMBER VACUUM TRIP LIGHT COMES ON WHEN BOTH ARE PRESSED.	907	CS-72-3	
	MAIN TRIP SLND 2 (TRIP AS LONG	-PPC-	TGT694	

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	AS BOTH BUTTONS ARE PRESSED.			
	ALL BYPASS VALVES CLOSE RAPIDLY IN REVERSE NUMERICAL SEQUENCE. BYPASS VALVE POSITION RECORDER INDICATES CLOSED FASTER THAN THE VALVES THEMSELVES.			
466172	CLOSE THE BYPASS VALVE OPENING JACK.	907	CS-63	

* * * END OF TEST 466100 * * *

ATTACHMENT 2

MP1 SYSTEM TEST ABSTRACTS

ATTACHMENT 8.1

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SYSTEM TEST ABSTRACTS

1. Automatic Pressure Relief System Test

   The Automatic Pressure Relief System Test was performed in July, 1988.

   The Automatic Pressure Relief (APR) System is designed to provide a backup method of rapidly reducing plant pressure during a small break loss of coolant accident. Reactor system depressurization and core cooling is normally accomplished under these conditions by the Feedwater Coolant Injection System. In the event that the Feedwater Coolant Injection System fails, the APR System opens selected safety relief valves (SRVs) to rapidly depressurize the reactor plant to within the injection pressure range of the Core Spray and Low Pressure Coolant Injection Systems.

   The following areas were tested:

   - Annunciators associated with APR were verified to alarm at their correct setpoint.
   - Remote functions associated with APR were verified to work correctly.
   - All control board hardware associated with APR was cycled to verify proper operation (i.e., valve handswitches, controllers, pushbuttons, etc.).

   Data used to support this test was obtained from P&ID's, electrical drawings, Plant Surveillance Data and Annunciator Setpoints from plant procedures.

   No deficiencies were identified.

2. Augmented Off-Gas System Test

   The Augmented Off-Gas System Test was performed in March, 1989.

   The Augmented Off-Gas (AOG) System recombines hydrogen and oxygen removed from the main condenser (off-gas), and reduces the amounts of radiation contained in the gases released at the plant stack.

Off-gas may be discharged to the plant stack through the 30-minute holdup line and the off-gas filters. When the AOG System is in operation, off-gas passes from the air ejectors through the recombiner and xenon-krypton subsystems before entering the stack.

Hydrogen and oxygen are present in the main condensers because of the decomposition of water under the influence of radiation in the reactor core. This process is called radiolysis. The gases are entrained with the steam leaving the reactor vessel and concentrate in the main condenser as non-condensibles. Recombination reduces total off-gas flow through the holdup line and reduces the probability of a damaging hydrogen-oxygen recombination fire or explosion in the Off-Gas System.

Xenon and krypton, usually present in the off-gas in trace amounts, are gases produced by fission. They may come from fission in uranium impurities near the surface of the fuel clad, or may escape from the fuel through pinhole leaks in the clad.

Xenon and krypton decay to radioactive cesium and rubidium, two particulates which tend to concentrate in the body. Removal of xenon and krypton contribute to the Millstone Station's goal of reducing radioactive releases to as low as practical.

The following areas were tested:

- Annunciators associated with AOG were checked for proper alarm setpoints.
- All remote functions associated with AOG were checked.
- All control board hardware associated with AOG were cycled, such as valve handswitches, controllers, reset pushbuttons, etc.
- AOG flowpaths through various component and heat exchanger combinations were checked.
- AOG system pumps were stopped and started to verify interlocks.
- AOG valve stroke times were verified.

Data used to support this test was obtained from P&ID's, electrical drawings, plant surveillance data and annunciator setpoints from plant procedures.

Thirty deficiencies were identified in this testing. One DR has been resolved.

The following 29 SDC's will be resolved by June 30, 1992:

89-1-0118	89-1-0120	89-1-0121	89-1-0122	89-1-0123
89-1-0124	89-1-0125	89-1-0126	89-1-0127	89-1-0128
89-1-0129	89-1-0130	89-1-0131	89-1-0133	89-1-0134
89-1-0135	89-1-0136	89-1-0138	89-1-0139	89-1-0140
89-1-0141	89-1-0142	89-1-0143	89-1-0144	89-1-0146
89-1-0147	89-1-0149	89-1-0150	89-1-0152	

3. Condensate/Feedwater System Test

The Condensate/Feedwater System Test was performed in June, 1988.

The Condensate (CN) System is an open-loop system that supplies heated, demineralized water to the Feedwater System. Condensed turbine exhaust steam, supplemented by makeup water from the condensate storage tank (CST), is pumped by the condensate pumps from the main condenser hotwells through demineralizers. The condensate booster pumps take a suction on the demineralizers and pump the water through feedwater heaters, where it is heated by extraction steam. From the feedwater heaters, condensate is delivered to the feedwater pump suction header. The Condensate System also supplies cooling and seal water to miscellaneous equipment.

The Feedwater (FW) System is an open-loop system that supplies heated water to the reactor vessel for steam generation. Condensed turbine exhaust steam is purified and preheated by the Condensate System and delivered to the suction of the reactor feed pumps. The feed pumps supply the head necessary to route the water through feedwater regulating valves which control the flow rate, feedwater heaters which further heat the water, and into the reactor vessel. The Feedwater System is also used in conjunction with the Feedwater Coolant Injection (FWCI) System to provide core cooling under post-accident conditions.

The following areas were tested:

- o Annunciators associated with the Condensate/Feedwater System were checked for proper alarm setpoints.
- o All remote functions associated with the Condensate/Feedwater Systems were checked.
- o All control board hardware associated with the Condensate/Feedwater System were cycled, such as valve handswitches, controllers, reset pushbuttons, etc.
- o With the Condensate and Feed Water System initially out of service, the both systems were started up.
- o Stroke times of safety related valves were checked.
- o The Short Recycle flowpath was verified along with condenser vacuum capabilities.
- o At 50% power, proper operation of Heater Drain Pumps and valves were verified.
- o At 100% power, Loss of TBCCW was tested for proper effects on the RFP's.
- o During LNP malfunction, the FWCI start logic was tested and found to be satisfactory.

Data used to support this test was obtained from P&ID's, electrical drawings, plant surveillance data and annunciator setpoints from plant procedures. Two deficiencies were identified. The following SDC's address these deficiencies and will be resolved by June 30, 1992.

88-1-0069   88-1-0083

4. Circulating Water System Test

The Circulating Water System Test was performed in July, 1988.

The Circulating Water (CW) System supplies cooling water to the main condensers to condense main turbine bypass steam or exhaust steam.

The following areas were tested:

- Annunciators associated with Circ Water System were verified to alarm at the correct setpoint.

- All control board hardware associated with the Circ Water System was cycled, i.e., valve handswitches, pump handswitches, etc.

- All pump and valve interlocks associated with the Circ Water System were tested.

- At power, all 4 Circ Pumps were cycled, all 4 water boxes were sequentially isolated, vented and backwashed.

- At 100% power, the following was tested: condenser vacuum relationship to the number of running Circ Water Pumps, Traveling Screen System response, Screen Wash System response, sensitivity to sea water temperature and proper operation of the Vacuum Priming System.

- All remote functions associated with the Circ Water System were tested.

Data used to support this test was obtained from P&ID's, electrical drawings and annunciator setpoints from plant procedures. No deficiencies currently exist.

5. Control Rod Drive System Test

The Control Rod Drive System Test was performed in July, 1988.

Reactor core reactivity and power level are normally controlled by positioning control rods in the reactor core using the Control Rod Drive (CRD) System, or by changing flow through the reactor core using the Reactor Recirculation Speed Control System. Control rods are generally used to:

- Control reactor power between the shutdown condition and the flow control power operating region.

- Shape core flux patterns.

- Compensate for fuel burnup over core life, and

- Rapidly shut down (scram) the reactor under emergency conditions.

The CRD System is comprised of three subsystems: the control rod blade, the control rod drive mechanism, and the Control Rod Drive Hydraulic Supply System (CRDHS). Neutron absorbing material is housed in the control rod blade which is positioned in the reactor core by the control rod drive mechanism. The control rod drive mechanism is a piston and cylinder arrangement which converts the drive water pressure supplied by the CRDHS into the mechanical energy required to insert and withdraw the control rod.

The following areas were tested:

- Annunciators associated with CRD were verified to alarm at their correct setpoints.
- Drive water functions associated with CRD were verified to work correctly.
- Remote functions associated with CRD were verified to operate correctly.
- All control board hardware associated with CRD was cycled to verify proper operation (i.e., handswitches, pushbuttons, etc.).
- All rods were moved to verify proper operation, indications and alarms.
- All flowpaths associated with CRD were verified to be correct.

Data used to support this test was obtained from P&ID's and electrical drawings. Setpoints for CRD and associated annunciators are from plant procedures.

No deficiencies currently exist.

6. Core Spray System Test

The Core Spray System Test was performed in April, 1988.

The Core Spray (CS) System is an Emergency Core Cooling System that provides cooling water to the core during a loss of coolant accident (LOCA) to remove heat and make up for coolant losses. The CS System is a low pressure system designed to cool the reactor core by direct impingement of high-density spray following reactor vessel depressurization.

The following areas were tested:

- o Annunciators associated with CS were verified to alarm at their correct setpoints.
- o Remote functions associated with CS were verified to work correctly.
- o All control board hardware associated with the CS was cycled to verify proper operation (i.e., valve handswitches, controllers, pushbuttons, etc.).
- o Stroke times of safety related valves were checked.
- o CS flowpaths through various pump/heat exchangers combinations were verified.
- o CS pumps were stopped and started to verify interlocks.

Data used to support this test was obtained from P&ID's, electrical drawings, plant surveillance data and annunciator setpoints from plant procedures.

No deficiencies were identified.

7. Containment/HVAC System

The Containment/HVAC System Test was performed in August, 1988.

The plant Heating, Ventilation and Air Conditioning (HVAC) System consists of a series of supply, exhaust and transfer fans with their connecting ducts and dampers which control the environment inside the Unit 1 buildings.

The Standby Gas Treatment (SBGT) System is an emergency ventilation system consisting of two redundant flowpaths used to ventilate the drywell or reactor building. The system utilizes carbon filters and HEPA filters in the exhaust flowpath.

The following areas were tested:

- o Annunciators associated with the Containment/HVAC System were verified to alarm at their correct setpoints.
- o Remote functions associated with the Containment/HVAC System were verified to operate correctly.
- o Drywell cooling fans were verified to operate properly.

- Standby Gas Treatment (SBGT) System was verified to operate properly.

- The Drywell was purged via SBGT by using the available flowpaths.

- Various miscellaneous HVAC fans were run to verify proper operation.

- All control board hardware associated with the Containment/HVAC System was cycled to verify proper operation (i.e., valve handswitches, controllers, pushbuttons, etc.).

Data used to support this test was obtained from P&ID's, electrical drawings, plant surveillance data and annunciator setpoints from plant procedures.

Five deficiencies currently exist on this system test.

The following SDC's address these deficiencies and they will be resolved by June 30, 1992:

88-1-0112   88-1-0104   88-1-0106   88-1-0107   88-1-0116

8. Electrical Distribution System Test

The Electrical Distribution System Test was performed in July, 1988.

This test includes the AC 345 KV, 4.16 KV, 480 V and 120 Volt (AC and DC) Distribution Systems. Some of the AC 4.16 KV, 480 V and 120 Volt (AC and DC) busses are safety related.

The following areas were tested:

- Annunciators associated with the Electrical Distribution System were verified to alarm at the correct setpoint.

- Remote functions associated with the Electrical Distribution System were verified to operate correctly.

- All control board hardware associated with the Electrical Distribution System was cycled to verify proper operation (i.e., breaker handswitches).

- 480 Volt buses were cross tied to verify correct response.

- 4160 Volt buses were tested to ensure that they could be fed from the NSST and the RSST.

- Verify that on a reactor trip the normal fast transfer occurs correctly for the Normal Station Service Transformer (NSST) to the Reserve Station Service Transformer (RSST).

- Verify electrical breaker interlocks.

- Verify NSST/RSST indication on the control boards.

- Verify non vital 120 volt transfer switches.

- Verify DC battery charger operation (125 VDC).

Data used to support this test was obtained from P&ID's, electrical drawings and annunciator setpoints from plant procedures.

Three deficiencies identified in this test now exist.

The following SDC's address these deficiencies and will be resolved by June 30, 1992.

88-1-0132   88-1-129   88-1-0136

9. Electrical Generation System Test

The Electrical Generation System Test was performed in March, 1988.

The Diesel Generator (D/G) is one of the onsite emergency power supplies. The D/G automatically starts during selected accident conditions to provide emergency electrical power to selected electrical buses and associated equipment.

The D/G and its auxiliary systems are self-contained, and capable of functioning regardless of reactor plant conditions.

The Gas Turbine Generator (GTG) is the other onsite emergency power supply. The GTG automatically starts during selected accident conditions to provide emergency electrical power to selected electrical buses and associated equipment.

The GTG and its auxiliary systems are self-contained, and capable of functioning regardless of reactor plant status.

The following areas were tested:

- o Annunciators associated with the Electrical Generation Systems were verified to alarm at their correct setpoints.
- o Remote functions associated with the Electrical Generation Systems were verified to work correctly.
- o All control board hardware associated with the Electrical Generation Systems were cycled to verify proper operation (i.e., breaker handswitches, pushbuttons, etc.).
- o The diesel generator was started and paralleled to its emergency bus and emergency shutdown performed.
- o The diesel generator was tested to carry its respective emergency bus, with loads started and stopped to verify proper LOAD/VAR response.
- o The gas turbine was started and paralleled to its emergency bus and emergency shutdown performed.
- o The gas turbine was tested while carrying its emergency buses, with loads started and stopped to verify proper LOAD/VAR response.
- o A Loss of Normal Power (LNP) was initiated to test proper diesel and gas turbine performance.
- o Various electrical faults were tested to verify diesel generator and gas turbine logic.
- o The Main Generator Hydrogen Seal Oil System was tested.
- o At 8% power, the main generator was "synchronized" to the grid.
- o At 100% power, main generator controls were tested and a manual trip performed to verify correct response.

Data used to support this test was obtained from P&ID's, and electrical drawings; annunciator setpoints were from plant procedures.

No deficiencies currently exist.

10. Instrument/Service Air System Test

The Instrument/Service Air System Test was performed in March, 1988.

The Plant Air System consists of the Instrument Air and Station Air Subsystems. The Plant Air System is divided into two major air headers which can be supplied from air compressors in either subsystem. The instrument air header supplies air to instrumentation and control devices and the station air header supplies the remainder of the plant's air services.

The following areas were tested at 100% power:

- o Annunciators associated with the Instrument and Station Air System were verified to alarm at their correct setpoints.
- o Remote functions associated with the Instrument and Station Air Systems were verified to work correctly.
- o All control board hardware associated with the Instrument Air and Station Air System was cycled to verify proper operation (i.e., valve handswitches, etc.).
- o Normal and abnormal flowpaths were tested.
- o All air compressors were started and stopped to verify proper loading and unloading sequences.
- o The Unit 1 to Unit 2 cross tie capability was tested.
- o Alternate cooling supplies to air compressors were tested.
- o Power supplies to the air compressors were tested.

Data used to support this test was obtained from P&ID's, and electrical drawings; annunciator setpoints were from plant procedures.

No deficiencies currently exist.

11. Low Pressure Coolant Injection

The Low Pressure Coolant Injection System Test was performed in May, 1988.

The Low Pressure Coolant Injection (LPCI) System provides high-volume emergency make-up to the reactor vessel in the event of a loss of coolant accident (LOCA). The LPCI and Emergency Service Water systems together constitute the Containment Cooling Subsystem. The LPCI System uses electric motor-driven pumps to transfer water from the suppression pool or condensate storage tank to the reactor vessel or the containment spray headers.

The following areas were tested:

- o Annunciators associated with LPCI were verified to alarm at their correct setpoints.
- o Remote functions associated with LPCI were verified to work correctly.
- o All control board hardware associated with LPCI were cycled to verify proper operation (i.e., valve handswitches, controllers, pushbuttons, etc.).
- o Stroke times of safety related valves were checked.
- o LPCI flowpaths through various pump/heat exchangers combinations were checked.
- o LPCI pumps were stopped and started to verify interlocks.

Data used to support this test was obtained from P&ID's, electrical drawings, plant surveillance data; annunciator setpoints were from plant procedures.

One deficiency exists at this time. This deficiency is addressed by SDC 88-1-0064 and will be resolved by June 30, 1992.

12. Main Steam System Test

The Main Steam System Test was performed in April, 1988.

The Main Steam (MS) System transports the steam produced in the reactor pressure vessel to the main turbine generator and support auxiliaries. The MS System also protects the reactor vessel from over-pressurization through a series of relief valve actuations during abnormal plant conditions.

The following areas were tested:

- o Annunciators associated with main steam were verified to alarm at their correct setpoints.
- o Remote functions associated with main steam were verified for proper operation.
- o All control board hardware associated with main steam was cycled to verify proper operation (i.e., valve handswitches, controllers, reset pushbuttons, etc.).
- o Normal and abnormal flowpaths were tested.

Data used to support this test was obtained from P&ID's, electrical drawings, and plant surveillance data; annunciator setpoints were from plant procedures.

No deficiencies were identified.

12. Nuclear Instrumentation System Test

The Nuclear Instrumentation System Test was performed in March, 1988.

The Source Range Monitor (SRM) System provides indication of neutron count rate and reactor period during startup, shutdown and refueling operations. The system consists of four independent channels of instrumentation, each consisting of a movable in-core detector and associated detector drives, process instrumentation, interlocks, and controls. Rod blocks are initiated by the SRM System to prevent outward control rod motion when the ability of the system to detect and display neutron flux level is degraded.

The Intermediate Range Monitoring (IRM) System is used to provide neutron flux signals for monitoring and protection during reactor startup and shutdown. The IRM System provides protective trips (rod blocks and scrams) in order to protect against rapid increases in reactor power which might otherwise cause fuel damage. The IRM System also provides a means to allow complete withdrawal of the IRM detectors from the core when IRMs are not required.

The Local Power Range Monitor (LPRM) System detects the local neutron flux within the core and provides indication for the operator and inputs to the rod block monitors, the average power range monitors, and the plant process computer.

The following areas were tested:

- Annunciators associated with the Nuclear Instrumentation System were verified to alarm at their correct setpoints.
- Remote functions associated with the Nuclear Instrumentation System were verified to work correctly.
- All control board hardware associated with the Nuclear Instrumentation System was cycled to verify proper operation (i.e., handswitches, pushbuttons, etc.).
- All intermediate range monitors were verified to work correctly.
- All source range monitors were verified to work correctly.
- All local power range monitors were verified to work correctly.

Data used to support this test was obtained from electrical drawings and annunciator setpoints from plant procedures.

No deficiencies currently exist.

14. Radiation Monitoring System Test

The Radiation Monitoring System Test was performed in July, 1988.

The Area Radiation Monitoring (ARM) System measures gamma radiation levels in various areas of the plant, indicates these levels in the control room, and alarms when radiation exceeds preset levels. In selected cases, local auxiliary units with radiation level indicators and visual and/or audible alarms are provided to warn people in associated areas.

The Process Radiation Monitoring (PRM) System monitors systems whose effluents are normally radioactive and systems that have the potential for radioactive release. The PRM System also furnishes information regarding radioactivity levels in the monitored systems to assist in maintaining radiation levels as low as practicable and to verify compliance with applicable regulations for the containment, control and release of radioactive liquids, gases, and particulates generated as a result of normal or emergency operations of the plant.

The following areas were tested at 100% power:

- o Annunciators associated with the Radiation Monitoring System were verified to alarm at their correct setpoints.

- o Remote functions associated with the Radiation Monitoring System were verified to work correctly.

- o All control board hardware associated with the Radiation Monitoring System was cycled to verify proper operation (i.e., handswitches, pushbuttons, etc.).

- o All Process Radiation Monitors were verified to work correctly.

- o All Area Radiation Monitors were verified to work correctly.

Data used to support this test was obtained from P&ID's, electrical drawings, and annunciator setpoints from plant procedures.

No deficiencies currently exist.

15. Reactor Building Closed Cooling Water (RBCCW) System

The RBCCW System Test was performed in June, 1988.

The Reactor Building Closed Cooling Water System (RBCCW) is a closed loop system which provides relatively pure, oxygen-free cooling water to equipment located in the reactor building. The RBCCW System transfers heat removed from equipment to the Service Water System via the RBCCW heat exchangers.

The following areas were tested:

- o Annunciators associated with RBCCW were verified to alarm at the correct setpoints.

- o All control board hardware associated with the RBCCW System were cycled, i.e., valve handswitches, pump handswitches, etc.

At 100% power, the following were tested:

- o RBCCW pumps were stopped and started to verify interlocks.
- o RBCCW flowpaths through various pumps/heat exchanger combinations were checked.
- o Heat loads on each RBCCW header were checked, such as shutdown cooling heat exchangers, RWCU Non-Regen H.X's, and Reactor Recirc Pump Coolers.
- o Remote functions associated with the RBCCW System were verified to work correctly.

Data used to support this test was obtained from P&ID's and electrical drawings; annunciator setpoints from plant procedures and plant surveillance data.

No deficiencies currently exist.

16. Reactor Recirculation System Test

The Reactor Recirculation System Test was performed in March, 1988.

The Reactor Recirculation (RR) System provides a variable forced circulation of water through the reactor core, allowing a higher power level to be achieved than with natural circulation alone. The Reactor Recirculation System, in conjunction with the Reactor Recirculation Speed Control (RRSC) System, provides a means of controlling reactor power over a limited range by adjusting the flow of coolant through the reactor core. Changing core flow provides reasonably fast control of overall reactor power.

The Reactor Recirculation (RR) System provides forced recirculation through the reactor core, providing increased power density. The two RR pumps are driven by motor-generator sets, each consisting of constant speed motor, a hydraulic coupler, and a variable speed generator. The RR Speed Control System uses operator-initiated pump speed demand signals to control the positions of hydraulic coupler scoop tubes, and thus generator and RR pump speeds.

The following areas were tested:

- o Annunciators associated with RR were verified to alarm at their correct setpoints.

- Remote functions associated with RR were verified to work correctly.

- All control board hardware associated with RR was cycled to verify proper operation (i.e., valve handswitches, controllers, pushbuttons, etc.).

- Recirc pumps were stopped and started to verify interlocks.

- Recirc pump controllers were checked through full range of travel and found to be satisfactory.

Data used to support this test was obtained from P&ID's and electrical drawings; annunciator setpoints were from plant procedures and the Reactor Recirculation System Technical Manual.

Three deficiencies currently exist for this system.

These deficiencies are addressed by SDC 88-1-0029 and will be resolved by June 30, 1992.

17. Reactor Water Cleanup System

The Reactor Water Cleanup System Test was performed in March, 1989.

The Reactor Water Cleanup (RWCU) System reduces secondary sources of beta and gamma radiation by removing corrosion products, fission products, and impurities from the reactor coolant system. Removing these impurities minimizes their deposition on heat transfer surfaces.

The RWCU System also provides a flowpath for removal of reactor coolant from the vessel during startup and shutdown operations when there is little or no steaming.

The following areas were tested:

- Annunciators associated with the Cleanup System were verified to alarm at their correct setpoints.

- Remote functions associated with the Cleanup System were verified for proper operation.

- All control board hardware associated with the Cleanup System was cycled to verify proper operation (i.e., valve handswitches, controllers, reset pushbuttons, etc.).

- The cleanup pump and aux cleanup pump were stopped and started to verify proper operation.

- Normal and abnormal flowpaths were tested.

Data used to support this test was obtained from P&ID's and electrical drawings; annunciator setpoints were from plant procedures.

No deficiencies currently exist.

18. Service Water System Test

The Service Water System Test was performed in March, 1988.

The Service Water (SW) System provides cooling water to the heat exchangers in the Turbine Building Closed Cooling Water System, Turbine Building Secondary Closed Cooling Water System, Reactor Building Closed Cooling Water System, and the Diesel Generator heat exchangers. The SW System also provides sealing water to the SW pumps and Circulating water pumps.

This system test was performed at 100% power. The following areas were tested:

- Annunciators associated with the Service Water System were verified to alarm at the correct setpoints.

- All remote functions associated with the Service Water System were tested for correct operation.

- All control board hardware associated with the Service Water System was cycled, i.e., valve handswitches, reset pushbuttons, etc.

- Service water pumps were started and stopped.

- Normal and backup Service Water flowpaths were tested.

- Service Water related temperature control valves were cycled.

- o Stroke times of Service Water safety related valves were tested.

Data used to support this test was obtained from P&ID's, (Piping and Instrumentation Drawings), electrical drawings, plant surveillance data and annunciator setpoints from plant procedures.

No deficiencies currently exist.

19. Standby Liquid Control System Test

The Standby Liquid Control System Test was performed in April, 1988.

The Standby Liquid Control (SLC) System is an engineered safeguard designed to provide a backup method of shutting down the reactor. An engineered safeguard is a system or feature incorporated into reactor plant design to provide reliable protection against fuel damage and the release of fission products. Reactor shutdown is normally accomplished by inserting control rods into the core. In the unlikely event that several control rods fail to insert during shutdown, the SLC System assures safe shutdown by injecting a neutron-absorbing boron solution into the reactor vessel.

The following areas were tested at 100% power:

- o Annunciators associated with the Standby Liquid Control System were verified to alarm at their correct setpoints.
- o Remote functions associated with the Standby Liquid Control System were verified to work correctly.
- o All control board hardware associated with the Standby Liquid Control System was cycled to verify proper operation (i.e., valve handswitches, controllers, pushbuttons, etc.).
- o Normal and abnormal flowpaths associated with the Standby Liquid Control System were tested.
- o Valve stroke times were checked and found to be satisfactory.

Data used to support this test was obtained from P&ID's, electrical drawings, and plant surveillance data; annunciator setpoints were from plant procedures.

No deficiencies currently exist.

20. Shutdown Cooling System Test

The Shutdown Cooling System Test was performed in March, 1988.

The Shutdown Cooling System (SDC) removes sensible and decay heat during a reactor cooldown, when coolant temperature is below 280°F. The Shutdown Cooling System can also be used as a backup for the Fuel Pool Cooling System.

The following areas were tested:

- o Annunciators associated with the SDC System were verified to alarm their correct setpoint.
- o Remote functions associated with the SDC System were verified to work correctly.
- o Normal and abnormal flowpaths associated with the SDC System were tested.
- o With the SDC System in operation, various combinations of equipment operation and flowpaths were tested to verify proper response.

Data used to support this test was obtained from P&ID's, electrical drawings, and plant surveillance data; annunciator setpoints were from plant procedures.

Two deficiencies exist at this time.

These deficiencies are addressed by the following SDC's and will be resolved by June 30, 1992:

88-1-0026 88-1-0027

21. Turbine System Test

The Turbine System Test was performed in September, 1988.

The main turbine and main generator together form an integrated turbine generator unit that converts the thermodynamic energy of the steam supplied by the reactor into electrical energy. In the process, the steam's energy is first converted to mechanical energy of the rotating turbine. This rotation provides the field motion necessary for the generator to produce electricity.

The following areas were tested:

- o Annunciators associated with the Turbine were verified to alarm at their correct setpoint.
- o Remote functions associated with the Turbine were verified to work correctly.
- o All control board hardware associated with the Turbine was cycled to verify proper operation (i.e., valve handswitches, controllers, reset pushbuttons, etc.).
- o Normal and abnormal flowpaths were tested.
- o The turbine was taken from a cold shutdown condition, warmed up and rolled up to 1800 RPM with auxiliary equipment tested during the turbine startup.
- o Auxiliary equipment tested included auxiliary oil, bearing oil, lift pumps, turning gear pump/motor and emergency oil pumps.
- o Various Turbine surveillances were performed such as main stop valve testing, intermediate stop valve (ISV) testing and control valve testing.

Data use to support this test was obtained from P&ID's, electrical drawings, and plant surveillance data; annunciator setpoints were from plant procedures.

Two deficiencies exist at this time.

The following SDC's were written and will be resolved by June 30, 1992:

88-1-0162
88-1-0164

22. Turbine Building Closed Cooling Water (TBCCW)

The TBCCW System Test was performed in March, 1988.

The Turbine Building Closed Cooling Water (TBCCW) System is a closed-loop system which provides cooling water to equipment located in the turbine and reactor buildings. The TBCCW System transfers heat removed from operating equipment to the Service Water System via the TBCCW heat exchangers.

The following areas were tested:

- o Annunciators associated with TBCCW were verified to alarm at the correct setpoint.
- o At 100% power, TBCCW heat exchangers were switched to check flowpaths. Degraded or lost TBCCW flow was verified to affect components served by TBCCW.
- o At 100% power, the Generator leads cooler and Stator Water Cooling System were also tested.
- o All remote functions associated with the TBCCW System were tested.

Data used to support this test was obtained from P&ID's and electrical drawings; annunciator setpoints were from plant procedures.

No deficiencies currently exist.

23. Turbine Building Secondary Closed Cooling Water (TBSCCW)

The Turbine Secondary Closed Cooling Water Test was performed in March, 1986.

The Turbine Building Secondary Closed Cooling Water (TBSCCW) System is a closed loop system which provides cooling water to equipment located in the turbine and reactor buildings. Heat removed from operating equipment is transferred to the Service Water System via the TBSCCW heat exchangers.

The following areas were tested:

- o At 100% power, TBSCCW heat exchangers were switched to check flowpaths. Degraded or lost TBSCCW flow was verified to affect components served by TBSCCW.

Data used to support this test was obtained from P&ID's, electrical drawings, and plant surveillance data; annunciator setpoints were from plant procedures.

No deficiencies currently exist.

24. Waste Disposal System

The Waste Disposal System Test was performed in June, 1988.

The Liquid and Solid Radwaste systems operate to collect and process the plant water or plant solids, such as used demineralizer resin, which is, or has the potential of being, contaminated from environmentally toxic or radioactive sources. This water is processed and cleaned so that it can be re-used in the power plant or safely discharged to the environment. The resulting contaminated sludge and solids which cannot be discharged or re-used, are solidified and sent to an off-site disposal or permanent storage facility.

In order to fulfill these functions, the Radwaste System used at Millstone Unit 1 is divided into the following four systems:

- o The Drains and Sumps System
- o The Waste Collector System
- o The Floor Drain Collector System
- o The Solid Radwaste/Spent Resin Transfer System

The following areas were tested:

- o Annunciators associated with the Waste Disposal System were verified to alarm at their correct setpoint.
- o Remote functions associated with the Waste Disposal System were verified to work correctly.
- o All control board hardware associated with the Waste Disposal System was cycled to verify proper operation (i.e., valve handswitches, controllers, pushbuttons, etc.).
- o Normal and abnormal flowpaths associated with the Waste Disposal System were tested.

Data used to support this test was obtained from P&ID's and electrical drawings; annunciator setpoints are from plant procedures.

No deficiencies currently exist.

25. Reactor Protection System Test

This Reactor Protection System Test was performed in July 1988.

The Reactor Protection System is designed to prevent fuel damage and primary system boundary failures during all modes of operation. The Reactor Protection System continuously monitors critical parameters and provides protective action in the form of a reactor scram or select rod insert if one or more of the monitored parameters reaches values which threaten the integrity of the reactor fuel or primary system.

The following areas were tested:

- o Annunciators associated with the reactor protection system were verified to alarm at their correct setpoint.
- o Remote funcitons associated with the reactor protection system were verified to work correctly.
- o All control board hardware associated with the reactor protection system was cycled to verify proper operation (i.e., control switches, push buttons).
- o The various conditions which cause the reactor protection system to trip were tested. The test results are listed with the applicable system test.
- o The manual scram circuit logic was verified to work correctly.
- o The bypasses, setdown, and trips associated with a load reject were tested for proper operation.
- o The EPA breakers and power supplies to the RPS busses were checked for proper operation.
- o The trip logic and interface with the Recirculation System and Control Rod Drive Hydraulic System was tested (ATWS).

- The Reactor Protection System response to a Group I isolation was verified.

Data used to support this test came from electrical drawings and annunciator setpoints from plant procedures.

No deficiencies currently exist.

26. Reactor Core System Test

This test was performed in March, 1990.

This test covers all of the core physics characteristics to ensure proper response of the simulator to operator actions.

The following areas were tested:

- Reactor start-ups from BOC, MOC AND EOC conditions to compare fuel depletion and fision product effects.
- Shut down margin calculations.
- Flux shape, axial and radial, under low power/no voids and high power/high voids.
- Transient fission product poison (Xe) effects (local and core wide).
- Moderator temperature effects.
- Localized power response to deep, intermediate, and shallow control rod movements.
- Core flow reactivity effects at power.

Data used to support this test was obtained from the "Supplemental Reload Licensing Submittal for Millstone Point Nuclear Power Station Reload 12 Cycle 13" General Electric document 23A5955, "Cycle Management Report, Millstone 1 Cycle 13", General Electric document 23A5990 Rev. 0, and reference plant historical data.

The deficiencies noted during this test were previously identified during the nuclear instrument and reactor manual control system tests. No new deficiencies were identified.

ATTACHMENT 3

MP1 NORMAL OPERATIONS AND
SURVEILLANCES TESTING SEQUENCE

This attachment is referenced by Section 3
of the Performance Test Summary

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1	DATE: APRIL 12, 1990
SYSTEM TITLE: STARTUP & SHUTDOWN OF MP1	PAGE: 13
TEST INDEX NUMBER : N/A	REV: 0
TEST TITLE: NORMAL OPERATIONS & SURVEILLANCES	NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DP
#320200.	STARTUP AND HEATUP PER OP 201 AND OP 202			
320201	RESET TO IC-3 READY FOR STARTUP, 175 DEG., MODE SWITCH IN SHUTDOWN, MOL.	-PCM-	IC-3	ℋ
320202	PREPARATIONS FOR STARTUP SURVEILLANCE PROCEDURES REQUIRED:			ℋ

401B	SRM FUNCTIONAL TEST	DR 90-1-0035
402B	IRM FUNCTIONAL TEST	DR 90-1-0036
404C	APRM CALIBRATION/FUNCTIONAL	
1049	RWM OPERABILITY TEST	DR 88-1-0064
608.13	CONDENSATE AND FEEDWATER SYSTEM PUMP DISCHARGE CHECK VALVE READINESS TEST	
608.30	COLD SHUTDOWN/REFUEL POWER OPERATED VALVE READINESS TEST	DR 90-1-0047
608.33	S/D, R/F TEST OF MASTER SCRAM SOLENOIDS, SDV VENT & DRAIN SOLENOIDS, AND SDV VENT & DRAIN VALVES	
609.1	MANUAL SCRAM FUNCTIONAL TEST	
610.1	MODE SWITCH IN S/D FUNCTIONAL TEST	
621.10	CORE SPRAY SYSTEM OPERABILITY TEST	

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: STARTUP & SHUTDOWN OF MP1
TEST INDEX NUMBER : N/A
TEST TITLE: NORMAL OPERATIONS & SURVEILLANCES

DATE: APRIL 12, 1990
PAGE: 14
REV: 0
NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	622.7 LPCI SYSTEM OPERABILITY TEST			
	623.19 ESW SYSTEM OPERATIONAL READINESS TEST			
	625.4 ECT PUMP OPERATIONAL READINESS TEST			
	646.6 FUNCTIONAL TEST WHEN ONE CIRCUIT OF THE STANDBY GAS TREATMENT SYSTEM BECOMES INOPERABLE			
	646.7 TEST OF OPERABLE SGTS FILTER TRAIN			
	646.8 15 MINUTE OPERATIONAL CHECK OF SGTS			
	646.9 SBGT SYSTEM FLOW RATE TEST			
	646.10 SBGT VALVES OPERABILITY TEST			
	668.1 DIESEL GEN. OPERATIONAL READINESS DEMONSTRATION			
	668.2 GAS TURBINE EMERG. FAST START TEST			
	672.1 MANUAL ATWS FUNCTIONAL TEST			
	690 B REACTIVITY MARGIN-CORE LOADING SHUTDOWN MARGIN TEST			
	ATTACH COMPLETED SURVEILLANCE DATA PACKAGES TO THIS PROCEDURE.			
320203	REMOVE THE SHUTDOWN COOLING SYSTEM FROM OPERATION. OP 305 REV 22 CH 0	904		JJ
	CLOSE THE DISCHARGE VALVE.			
	STOP THE PUMP.			

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	CLOSE THE PUMP SUCTION VALVE.			
	REACTOR WATER TEMPERATURE INCREASES SLOWLY DUE TO DECAY HEAT.			
	STOP B RBCCW PUMP			
	SECURE C RBCCW HX.	-PCM-	RCR04	
320204	PLACE THE REACTOR MODE SWITCH IN START+HOT STANDBY.	905		JJ
320205	RECORD THE SRM COUNT RATES: CHANNEL 21 140-180 CPS. 10 CPS		DR 88-1-0199	JJ
	CHANNEL 22 140-180 CPS. 10.2 CPS			
	CHANNEL 23 140-180 CPS. 10.3 CPS			
	CHANNEL 24 140-180 CPS. 10.1 CPS			
320206	WITHDRAW CONTROL RODS IN THE LATCHED RWM SEQUENCE UNTIL THE STABLE SRM COUNT RATE HAS DOUBLED ALMOST FOUR (4) TIMES.	905		JJ
	OP 201 REV 20 CH 0			
	DURING STARTUP, COMPLETE AND ATTACH OP 201 DATA PACKAGES.			
	EVIDENCE OF PROPER SUBCRITICAL MULTIPLICATION IS OBSERVED.			
320207	CONTINUE TO WITHDRAW CONTROL RODS MOVING ALL RODS IN THE GROUP ONE NOTCH AT A TIME UNTIL CRITICALITY IS ACHIEVED.	905		JJ
	NEUTRON FLUX CONTINUES TO RISE ON A STABLE PERIOD WITHOUT			

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	FURTHER ROD MOVEMENT.			
	RECORD THE FOLLOWING DATA:			
	PERIOD 100 SEC.			
	ROD 38-19			
	ROD GROUP 2			
	ROD NOTCH 24			
	RX WATER TEMPERATURE 192° F.			
320208	CONTINUE TO WITHDRAW CONTROL RODS AND VERIFY THAT PERIOD CAN BE CONTROLLED. ESTABLISH A PERIOD OF ABOUT 100 SECONDS.	905		
320209	OBSERVE SRM-IRM OVERLAP.			
	IRM'S BEGIN TRACKING THE FLUX INCREASE.			
320210	WITHDRAW SRM DETECTORS AS REQUIRED TO MAINTAIN INDICATION BETWEEN 100 AND 10E5 CPS.	905		
	VERIFY RETRACT PERMIT LIGHTS ON WHEN SRM COUNT RATE IS BETWEEN 200 AND 10E5 CPS.			
320211	RANGE THE IRM'S TO MAINTAIN BETWEEN 25-75 ON THE 0-125 SCALE.	905	DR 90-1-0032	
	THE POINT OF ADDING HEAT IS REACHED AT ABOUT RANGE 6-8.			
	POWER TURNS AND TEMPERATURE STABILIZES.			
	PERFORM SP633.1 "TEMPERATURE			

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	LOGGING DURING AND SUBSEQUENT TO REACTOR HEATUP AND COOLDOWN.			
	ATTACH HEATUP GRAPH (SP 633.1-1) WHEN HEATUP COMPLETED.			
320212	CONTINUE TO WITHDRAW CONTROL RODS AND ESTABLISH A HEATUP RATE LESS THAN 60 DEG/HR, BASED ON RECIRC LOOP TEMPERATURES. MAINTAIN THE HEATUP THROUGHOUT THE REMAINDER OF THIS TEST.	904		JJ
	OP 202 REV 12 CH 0			
	PULL SRM'S OUT AND OBSERVE FULL OUT INDICATION.			
	IRM'S ARE ALL ON RANGE 8 OR ABOVE.			
	WATER TEMPERATURE IS 205 DEG.			
320213	OBSERVE THE REACTOR VESSEL METAL TEMPERATURE RECORDER FOR SIGNIFICANT LAG BEHIND WATER TEMPERATURE.	921		JJ
	OBSERVE THE HEATING EFFECTS OF STEAM IN THE TURBINE CHEST ON TEMPERATURE RECORDER.	907		JJ
	75 PSIG, HEATUP IN PROGRESS AT 60 DEG/HR, MOL.			
320214	PLACE THE GLAND SEAL REGULATOR IN SERVICE AND SECURE AUXILIARY SEAL STEAM.	-PCM-	RF-MSR09	JJ
	OP 324A REV 18 CH 2			
	OPEN THE SEAL STEAM FEED	907		

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	VALVE SLOWLY UNTIL PRESSURE STABILIZES AT ABOUT 4 PSIG. THEN OPEN IT FULLY.			
	SET THE AUX SEAL STEAM SUPPLY PRESSURE TO 0.	-PCM-	RF-MSR09	JJ
320215	PLACE THE MAIN RWCU PUMP IN OPERATION WITH REACTOR PRESSURE BETWEEN 75 AND 100 PSIG.	904		
	OP 303 REV 19 CH 2			
	START ONE MAIN PUMP AND OPEN ITS DISCHARGE VALVE. (IT MAY BE NECESSARY TO TAKE MANUAL CONTROL OF THE PRESSURE CONTROLLER TO PREVENT LOW SUCTION PRESSURE FROM TRIPPING THE PUMP.)			
	CLOSE THE MAIN PUMP BYPASS VALVE.			
	OPEN THE AUX PUMP BYPASS.			
	STOP THE AUX PUMP.			
	CLOSE 1-CU-5 AND -8.			
320216	PLACE THE STEAM JET AIR EJECTORS IN OPERATION, DISCHARGING TO THE DELAY LINE.	907		JJ
	OVERRIDE THE SJAE LOW STEAM PRESSURE ISOLATION AND PRESS THE SUCTION VALVE RESET.			
	OPEN TRAP BYPASS 1-MS-46 AND STRAINER BLOWDOWN 1-MS-71.			
	OPEN TRAP BYPASS 1-MS-58.			

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	ADJUST THE STEAM SUPPLY BYPASS 1-MS-51 TO MAINTAIN 110 PSIG.			
	OPEN A-B CROSSOVER 1-AR-4.			
	OPEN ELEMENT CROSSOVERS 1-AR-3A AND -3B.			
	OPEN FCV 1-AR-601.			
	OPEN OFFGAS ELEMENT 1.			
	ADJUST THE STEAM SUPPLY BYPASS 1-MS-51 TO MAINTAIN 110 PSIG.			
	OPEN STEAM TO ELEMENT 1.			
	ADJUST THE STEAM SUPPLY BYPASS 1-MS-51 TO MAINTAIN 110 PSIG.			
	OPEN ELEMENT 1 AIR SUCTION.			
	OPEN OFFGAS ELEMENT 2.			
	ADJUST THE STEAM SUPPLY BYPASS 1-MS-51 TO MAINTAIN 110 PSIG.			
	OPEN STEAM TO ELEMENT 2.			
	ADJUST THE STEAM SUPPLY BYPASS 1-MS-51 TO MAINTAIN 110 PSIG.			
	OPEN ELEMENT 2 AIR SUCTION.			
	OPEN STEAM SUPPLY VALVES 1-MS-48 AND -50.			

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: STARTUP & SHUTDOWN OF MP1
TEST INDEX NUMBER : N/A
TEST TITLE: NORMAL OPERATIONS & SURVEILLANCES

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STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	CLOSE 1-MS-51 ALLOWING THE PRESSURE CONTROL VALVE TO MAINTAIN 120 PSIG.			
	CLOSE 1-MS-71 AND 1-MS-58			
	PUSH OFF GAS SUCTION RES[illegible] BUTTON.			
	PLACE THE SJAE LOW STEAM PRESSURE ISOLATION SWITCH IN NORMAL.			
	STOP MECH. VACUUM PUMP			
320217	START THE OTHER SJAE ON DELAY LINE ,THEN SHIFT THE FIRST SET TO THE OFFGAS SYSTEM.	924		JJ
	OP 324C(AOGS) REV 6 CH 3			
	OPEN THE RECOMBINER INLET.			
	OPEN THE STEAM SUPPLY AND START BOTH OFFGAS ELEMENTS.	-PCM- -PCM-	OGR01 OGR02	
	OPEN STEAM TO THE PREHEATER.			
	CLOSE THE AFTER CONDENSER INLETS AND OPEN THE RECOMBINER INLETS.			
	OPERATE WITH STEAM ONLY UNTIL FLOWS AND TEMPERATURES STABILIZE.			
	OPEN STEAM TO ELEMENT 1 AND OPEN THE AIR SUCTION.			
	CLOSE THE FIRST SJAE SET			

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	DISCHARGE TO AFTER CONDENSER AND OPEN ITS DISCHARGE TO OFFGAS.			
	INCREASE THE MPR SETPOINT TO KEEP IT 50-100 PSIG ABOVE STEAM PRESSURE.	907		
320218	PLACE A CONDENSATE BOOSTER PUMP IN OPERATION.	906		FH
	START THE AUX OIL PUMPS FOR ALL BOOSTER PUMPS.	-PCM-	RF-FWR36 RF-FWR37 RF-FWR38	
	START THE PUMP.			
320219	PERFORM SP608.28 RFP RECIRC MIN FLOW VALVES READINESS TEST 300 PSIG, HEATUP IN PROGRESS AT 60 DEG/HR, MOC.			FH
320220	TEST THE OPERATION OF THE MPR.	907		FH
	REDUCE THE MPR SETPOINT TO JUST BELOW CURRENT STEAM PRESSURE AND OBSERVE THAT THE BYPASS VALVES BEGIN TO OPEN.			
	INCREASE THE SETPOINT AND CONTINUE TO KEEP IT 50-100 PSI ABOVE STEAM PRESSURE.			
	OBSERVE THE BYPASS VALVES CLOSE			
320221	PLACE A REACTOR FEED PUMP IN OPERATION.	906		FH
	START TWO SEAL WATER INJECTION PUMPS			

CERTIFICATION SYSTEM TEST

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TEST TITLE: NORMAL OPERATIONS & SURVEILLANCES	NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	START THE FEED PUMP.			
320222	STOP INCREASING THE MPR SETPOINT AT 980 PSIG.	907		
	MPR OPENS BYPASS VALVES WHEN PRESSURE IS AT ABOUT 980 PSIG.			
320223	WHEN ALL APRM DOWNSCALE ALARMS HAVE CLEARED, AND BEFORE EXCEEDING 15% POWER, PLACE THE REACTOR MODE SWITCH IN RUN.			
320224	SHIFT THE IRM/APRM RECORDERS TO APRM.			
	PLACE THE EPR IN SERVICE.			
320225	WITHDRAW THE IRM DETECTORS.	905		
320226	CONTINUE TO WITHDRAW CONTROL RODS UNTIL 1.5 BYPASS VALVES ARE OPEN	905		

* * * END OF TEST 320200 * * *

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
#320300,	STARTUP TO RATED POWER			
320301	RESET TO IC-11	-PCM-	IC-11	
	22% POWER, MODE SWITCH IN RUN, TURBINE READY TO ROLL, MOL.			
320302	ROLL THE TURBINE TO 1800 RPM.	907		
	OP 314 REV 19 CH Ø			
	SELECT THE TURBINE LUBE OIL TEMPERATURE CONTROLLER TO 110 DEG.	-PCM-	RF-CCR15	
	INCREASE THE LOAD LIMIT SLOWLY UNTIL THE CONTROL VALVES OPEN AND THE TURBINE ROLLS OFF THE JACK.			
	STOP THE TURNING GEAR OIL PUMP AND TURNING GEAR MOTOR, LEAVING THEM IN AUTO.			
	INCREASE SPEED UNTIL THE GOVERNOR TAKES CONTROL.			
	INCREASE THE LOAD LIMIT TO MAXIMUM.			
	INCREASE THE SPEED/LOAD CHANGER TO INCREASE TURBINE SPEED TO 1800 RPM.	907		
	STOP THE AUX OIL PUMPS AND PLACE THEM IN AUTO.			
	SECURE TURBINE LIFT PUMP			

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: STARTUP & SHUTDOWN OF MP1
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NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
320303	SYNCHRONIZE THE GENERATOR TO THE GRID.	907		JF
	TURN ON LEADS COOLING	-PCM-	CCR18	
	OP 340 REV 28 CH 0			
	OPEN THE GENERATOR OUTPUT BREAKERS AND CLOSE THE GENERATOR DISCONNECTS.	GETAC		
	CHECK LEADS FAN ON.	-PCM-	CCR12	
	CLOSE THE GENERATOR FIELD BREAKER.			
	PLACE THE VOLTAGE REGULATOR MODE SWITCH TO MANUAL AND ADJUST TERMINAL VOLTAGE TO 24KV.(500 VOLTS EXCITER VOLTAGE AND 1046 AMPS-NO LOAD FIELD CURRENT)			
	PLACE THE VOLTAGE REGULATOR MODE SWITCH TO BALANCE-MANUAL, THEN ZERO THE DEVIATION AND PLACE IT IN AUTO.			
	SELECT GES AND CLOSE ONE OF THE GENERATOR OUTPUT BREAKERS.			
	SELECT IJS AND CLOSE THE OTHER OUTPUT BREAKER.			
	SHIFT H2 MONITOR TO NORMAL.	-PCM-	CCR17	
	INCREASE THE SPEED/LOAD CHANGER TO PICK UP LOAD UNTIL THE BYPASS VALVES ARE CLOSED.			
	INCREASE THE SPEED/LOAD			

D4E

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	CHANGER TO MAXIMUM.			
320304	TRANSFER BUSES 14A-14D FROM THE RSST TO THE NSST. OP 341 REV 20 CH 0 SELECT EACH BREAKER FOR SYNCHRONIZATION. PLACE THE BREAKER CONTROL SWITCH TO CLOSE TO CLOSE THE SUPPLY FROM NSST, THEN RELEASE IT TO TRIP THE SUPPLY FROM RSST. TURN THE SYNCHROSCOPE OFF.	908		JH
320305	CONTINUE TO WITHDRAW CONTROL RODS TO INCREASE POWER. OP 203 REV 11 CH 1	905		JH
320306	PLACE ADDITIONAL CONDENSATE DEMINS IN SERVICE AS REQUIRED TO CONTROL DIFFERENTIAL PRESSURE.	-PCM-	RF-FWR15 RF-FWR21	JH
320307	ESTABLISH NITROGEN FLOW TO THE TORUS TO INERT THE DRYWELL (USE FAST TIME TO ESTABLISH EQUILIBRIUM).	903		JH
320308	WHEN INERTED, SECURE THE NITROGEN AND CORRECT THE DRYWELL/TORUS DIFFERENTIAL PRESSURE, THEN ISOLATE THE DRYWELL VENTILATION SYSTEM.			JH
320309	PERFORM SP626.3, MANUAL OPERATION OF RELIEF VALVE WHEN AT OPERATING PRESSURE.			JH

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
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TEST INDEX NUMBER : N/A
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REV: 0
NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	PERFORM SP1030, REACTOR CORE MAXIMUM FRACTION OF LIMITING POWER DENSITY CHECK	PLANT PROCESS COMPUTER	86-1-0342	
	PERFORM SP1031, LOCAL AND AVERAGE PLANAR LINEAR HEAT GENERATION RATE (LHGR AND APLHGR) SURVEILLANCE			
	PERFORM SP1032 MINIMUM CRITICAL POWER RATIO (MCPR) SURVEILLANCE			
	50% POWER, JUST BELOW 100% ROD PATTERN, MOL.			
320310	START A SECOND CONDENSATE BOOSTER PUMP, CONDENSATE PUMP, AND REACTOR FEED PUMP.	906		
	PERFORM SP 611.1, MSIV CLOSURE FUNCTIONAL TEST.			
320311	AT ABOUT 80% POWER, START THE THIRD CONDENSATE PUMP AND CONDENSATE BOOSTER PUMP.			
320312	INCREASE RECIRC LOOP FLOW TO INCREASE POWER TO 100%.	905		
320313	USE FAST TIME TO ALLOW XENON TO REACH EQUILIBRIUM.			
	100% POWER, EQUILIBRIUM XENON, MOL.			
	PERFORM SP 627.3, ISOLATION CONDENSER HEAT REMOVAL CAPABILITY DETERMINATION			
	PERFORM SP 623.4, SUPPRESSION CHAMBER WATER LEVEL CHECK			

* * * END OF TEST 320300 * * *

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
#320350,	REACTOR TRIP AND RECOVERY			
320351	RESET TO IC-13 100% POWER, EQUILIBRIUM XENON, MOL.	PCM	IC-13	
320352	MANUALLY SCRAM THE REACTOR USING THE CRP 905 PUSHBUTTONS. CARRY OUT ONP 502, EMERGENCY PLANT SHUTDOWN. ONP 502 REV 9 CH 0	905		
320353	VERIFY THE REACTOR PERIOD TO BE APPROXIMATELY -80 SEC AT ABOUT ONE MINUTE AFTER THE SCRAM. PERIOD: -90	905		
320354	PERFORM OP 207, SCRAM RECOVERY. OP 207 REV 13 CH 1			
320355	PERFORM A REACTOR STARTUP AND PLANT STARTUP TO APPROXIMATELY 15% POWER USING OP 201, OP 202, AND OP 203 AS GUIDES. OP 201 REV 20 CH 0 OP 202 REV 17 CH 0 OP 203 REV 11 CH 1 FINAL CONDITIONS ARE: PLANT AT ABOUT 15% POWER, FEED REG VALVES IN AUTO.			

* * * END TEST 320350 * * *

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1	DATE: APRIL 12, 1990
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TEST TITLE: NORMAL OPERATIONS & SURVEILLANCES	NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
#320400,	SHUTDOWN TO HOT STANDBY			JH
	THIS SECTION SHUTS DOWN THE REACTOR TO HOT STANDBY MAINTAINING REACTOR CRITICAL AT LESS THAN 600 PSIG AND MSIV'S CLOSED.			
	OP 205 REV 13			
	UPON COMPLETION, ATTACH 205-1, 205-2			
320401	RESET TO IC-13.	-PCM-	IC-13	JH
	100% POWER, EQUILIBRIUM XENON, MOL.			
	PERFORM SP 1048 RODWORTH MINIMIZER SEQUENCE VERIFICATION	DR 88-1-0064		JH
320402	REDUCE REACTOR POWER BY RUNNING BACK RECIRC FLOW AND INSERTING CONTROL RODS WHILE PERFORMING THE FOLLOWING STEPS.	905		JH
320403	AT ABOUT 80% POWER STOP ONE OF THE THREE RUNNING CONDENSATE BOOSTER PUMPS AND CONDENSATE PUMPS.			JH
320404	REMOVE CONDENSATE DEMINS FROM SERVICE AS NECESSARY.	-PCM-	FWR15	JH
		-PCM-	FWR16	
		-PCM-	FWR17	
		-PCM-	FWR18	
		-PCM-	FWR19	
		-PCM-	FWR20	
		-PCM-	FWR21	

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: STARTUP & SHUTDOWN OF MP1
TEST INDEX NUMBER : N/A
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STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
320405	STOP ONE OF THE TWO RUNNING REACTOR FEED PUMPS.	906		JH
320406	TRANSFER BUSES 14A-14D FROM NSST TO RSST.	908		JH
320407	OPEN ONE OF THE MAIN GENERATOR LINE BREAKERS.	GETAC		JH
320408	USE THE SPEED/LOAD CHANGER TO DECREASE GENERATOR LOAD TO ZERO.	907		JH
	BYPASS VALVES OPEN TO CONTROL REACTOR PRESSURE.			
320409	DECREASE EXCITATION TO OBTAIN UNITY POWER FACTOR.			JH
320410	OPEN THE REMAINING GENERATOR LINE BREAKER.	GETAC		JH
320411	TRIP THE TURBINE.			JH
	OPEN FIELD BKR.			
	AUXILIARY OIL PUMPS START AS OIL PRESSURE DECREASES BELOW 190 PSIG.			
320412	PLACE THE AMPLIDYNE VOLTAGE REGULATOR SWITCH IN OFF.			JH
	OPEN 15G-1X1-4			
320413	STOP TBCCW TO GENERATOR LEADS COOLER.	-PCM-	RF-CCR18	JH
320414	SHIFT H2 MONITOR TO VENT	-PCM-	CCR17	JH
320415	START THE LIFT PUMPS WHEN TURBINE SPEED IS ABOUT 900 RPM.	907		JH

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: STARTUP & SHUTDOWN OF MP1
TEST INDEX NUMBER : N/A
TEST TITLE: NORMAL OPERATIONS & SURVEILLANCES

DATE: APRIL 12, 1990
PAGE: 30
REV: 0
NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DI
320416	DECREASE THE LOAD LIMIT, SPEED/ LOAD CHANGER, AND SV-2 BYPASS VALVE TO MINIMUM.			JH
320417	SET THE TURBINE LUBE OIL TEMPERATURE CONTROLLER TO 90 DEG.	-PCM-	RF-CCR15	JH
320418	OPEN THE FOLLOWING TURBINE DRAINS: 1-ES-3, -7, -11, -16 1-MS-37 1-MS-64A, B, C, D 1-MS-66A, B, C, D			JH
320419	WHEN TURBINE REACHES 0 SPEED, CHECK THAT THE TURBINE GOES ON TO THE TURNING GEAR.	907		JH
320420	TRANSFER FEEDWATER CONTROL TO MANUAL.	905		JH
320421	FULLY INSERT ALL IRM DETECTORS AND ADJUST THE RANGE SWITCHES FOR PROPER INDICATION.	905		JH
320422	WITH ALL APRM'S STILL ABOVE 5% POWER, PLACE THE REACTOR MODE SWITCH IN START+HOT STANDBY			JH
320423	PERFORM SP633.1, TEMPERATURE LOGGING DURING AND SUBSEQUEST TO REACTOR HEATUP AND COOLDOWN. UPON COMPLETION, ATTACH FORM 633.1-1.			JH
320424	CONTINUE REDUCING POWER UNTIL JUST CRITICAL ABOUT 500 PSIG.			JH
320425	SNAPSHOT TO IC-60.	-PCM-	IC-60-SNAP	JH

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1 — DATE: APRIL 12, 1990
SYSTEM TITLE: STARTUP & SHUTDOWN OF MP1 — PAGE: 31
TEST INDEX NUMBER : N/A — REV: 0
TEST TITLE: NORMAL OPERATIONS & SURVEILLANCES — NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	REACTOR IN HOT STANDBY, MOL. REACTOR IS LESS THAN 600 PSIG AND IRM'S ARE APPROXIMATELY RANGE 6-8.			
320426	SECURE SJAE AND OFFGAS			[illegible]
320427	BREAK VACUUM.	907		[illegible]
320428	SECURE GLAND SEAL.			[illegible]
20429	CLOSE MSIV'S.	903		[illegible]

* * * END OF TEST 320400 * * *

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: STARTUP & SHUTDOWN OF MP1
TEST INDEX NUMBER : N/A
TEST TITLE: NORMAL OPERATIONS & SURVEILLANCES

DATE: APRIL 12, 1990
PAGE: 32
REV: 0
NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DI
#320500,	COOLDOWN TO COLD SHUTDOWN			
	THIS SECTION COOLS DOWN THE PLANT BY BLEEDING STEAM TO THE MAIN CONDENSER, THEN STARTING THE SHUTDOWN COOLING SYSTEM.			
	OP 206 REV 12 CH 0			
320501	RESET TO IC-60.	-PCM-		JH
320502	CONTINUE TO INSERT ALL CONTROL RODS.	905		JH
320503	INSERT ALL SRM DETECTORS TO MAINTAIN INDICATION BETWEEN 200 AND 10E5 CPS.			JH
320504	INCREASE THE BYPASS VALVE JACK SUFFICIENTLY TO OBTAIN A COOLDOWN RATE OF ABOUT 60 DEG/HR..			JH
320505	SECURE THE SJAE. RUN THE MECHANICAL VACUUM PUMP IF NEEDED TO MAINTAIN CONDENSER VACUUM.	906		JH
320506	WHEN REACTOR PRESSURE IS LESS THAN 150 PSIG AND RECIRC LOOP TEMPERATURES ARE LESS THAN 350 DEG START A SECOND RBCCW PUMP AND PLACE ALL RBCCW HEAT EXCHANGERS IN SERVICE, THEN START THE SHUTDOWN COOLING SYSTEM.	-PCM-	RCR04	JH
320507	WHEN REACTOR PRESSURE IS LESS THAN 100 PSIG, START THE RWCU AUXILIARY PUMP.	904		JH

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: STARTUP & SHUTDOWN OF MP1
TEST INDEX NUMBER : N/A
TEST TITLE: NORMAL OPERATIONS & SURVEILLANCES

DATE: APRIL 12, 1990
PAGE: 33
REV: 0
NE: 3200

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
320508	WHEN REACTOR PRESSURE IS LESS THAN 75 PSIG, STOP THE RWCU MAIN PUMP.			JH
320509	SHIFT TURBINE GLAND SEAL STEAM TO AUXILIARY STEAM.			JH
320510	OPEN THE CONDENSER VACUUM BREAKER.	907		JH
	BYPASS VALVES TRIP WHEN VACUUM IS LESS THAN 7 IN HG.			
320511	SECURE AUXILIARY GLAND SEALING STEAM.			JH
320512	SECURE THE STEAM PACKING EXHAUSTER			JH
320513	PURGE OFF GAS			JH
320514	START HEAD SPRAY TO AID IN COOLING THE REACTOR HEAD.	904		JH
320515	WHEN LESS THAN 212 F, PLACE MODE SW TO SHUTDOWN AND OPEN HEAD VENTS.			JH
320516	FINAL SHUTDOWN CONDITIONS:			JH
	REACTOR IN SHUTDOWN MODE			
	ALL RODS IN.			
	REACTOR PRESSURE 0			
	REACTOR TEMPERATURE APPROX. 210 F.			
	SHUTDOWN COOLING IN OPERATION.			
	REACTOR IN SHUTDOWN, MOL.			

PERFORMED BY [signature]

DATE 5/4/90

* * * END OF TEST 320500 * * *

ATTACHMENT 4

MP1 SURVEILLANCES THAT ARE AVAILABLE FOR SIMULATOR TRAINING

Figure 7.3

SURVEILLANCE LISTING

UNIT MP1

Sequential Number	Title	Procedure #	(Yes/No) To Be Tested
1	SRM Functional Test	SP 401B	Yes
2	IRM Functional Test	SP 402B	Yes
3	APRM Calibration/Functional	SP 404C	Yes
4	Condensate and Feedwater System Pump Discharge Check Valve Readiness Test	SP 608.13	Yes
5	Reactor Feed Pump Recirc Min. Flow Valve Readiness Test	SP 608.28	Yes
6	Cold Shutdown/Refuel Power Operated Valve Readiness Test	SP 608.30	Yes
7	Shutdown/Refuel Test of Master Scram Solenoids, Scram Discharge Volume Vent & Drain Solenoids, and SDV Vent and Drain Valves	SP 608.33	Yes
8	Manual Scram Functional Test	SP 609.1	Yes
9	Mode Switch in Shutdown Functional Test	SP 610.1	Yes
10	MSIV Closure Functional Test	SP 611.1	Yes
11	Core Spray System Operability Test	SP 621.10	Yes

Approved: M.C. Jensen
ASOT

Figure 7.3

SURVEILLANCE LISTING

UNIT MP1

Sequential Number	Title	Procedure #	(Yes/No) To Be Tested
12	LPCI System Operability Test	SP 622.7	Yes
13	Suppression Chamber Water Level Check	SP 623.4	Yes
14	Emergency Service Water System Operational Readiness Test	SP 623.19	Yes
15	Emergency Condensate Transfer Pump Operational Readiness Test	SP 625.4	Yes
16	Manual Operation of Relief Valve when at Operating Pressure	SP 626.3	Yes
17	Isolation Condenser Heat Removal Capability Determination	SP 627.3	Yes
18	Temperature Logging During and Subsequent to Reactor Heatup and Cooldown	SP 633.1	Yes
19	Functional Test when one Circuit of the Standby Gas Treatment System becomes Inoperable	SP 646.6	Yes
20	Test of Operable SGTS Filter Train	SP 646.7	Yes
21	15 Minute Operational Check of SGTS	SP 646.8	Yes

Approved: M. C. [signature]
ASOT

Figure 7.3

SURVEILLANCE LISTING

UNIT MP1

Sequential Number	Title	Procedure #	(Yes/No) To Be Tested
22	SBGT System Flow Rate Test	SP 64[illegible].9	Yes
23	Standby Gas Treatment Valve Operability Test	SP 646.10	Yes
24	Diesel Generator Operational Readiness Demonstration	SP 668.1	Yes
25	Gas Turbine Emergency Fast Start Test	SP 668 2	Yes
26	Manual ATWS Functional Test	SP 672.1	Yes
27	Reactivity Margin-Core Loading Shutdown Margin Test	SP 690B	Yes
28	Reactor Core Maximu Fraction of Limiting Power Density Check	SP 1030	Yes
29	Local and Average Planar Linear Heat Generation Rate (LHGR and APLHGR) Surveillance	SP 1031	Yes
30	Minimum Critical Power Ratio (MCPR) Surveillance	SP 1032	Yes
31	Rod Worth Minimizer Sequence Verification	SP 1048	Yes
32	Rod Worth Minimizer Operability Test	SP 1049	Yes

Approved: M.C. Jensen
ASOT

ATTACHMENT 5

MP1 MALFUNCTION TEST ABSTRACTS

1. LOSS OF COOLANT MALFUNCTION ABSTRACTS

MS01 Malfunction - Unisolable Main Steam Rupture In Drywell

This malfunction test was conducted in May 1989.

This malfunction is capable of inserting on unisolable main steam line rupture in the Drywell, from any of the four main steam lines. The steam flow through a 100% break will increase to 3.75 E6 lbm/hr in the effected steam line, limited by the flow restrictor.

This malfunction was tested at 100%, 20%, and .1% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from Updated FSAR Section 6.2, Containment Systems, and best estimate analysis.

Two deficiencies were identified. A small steam line break (20% severity; 0.5ft^2 break) should cause Drywell temperature to peak at about 340°F. The simulator temperatures peaked at about 280°F. This deficie[illegible] tracked by DR 89-1-0166 and will be resolved by 06/30/9[illegible] minute steam line break (0.1% severiy) caused drywell pressure to initially decrease, then increase. This response has been corrected.

CU04 Malfunction [illegible] System Leak

This malfunction [illegible]cted in March 1989.

This malfunction is capable of inserting a 500 gpm leak at the influent inlet to the regenerative heat exchanger.

This malfunction was tested at 100%, 50%, and 5% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis.

Two deficiencies were identified:

Upon entering the malfuction at 100% (500 gpm leak), RWCU system pressure decreased too slowly. Correction is being tracked under DR 89-1-0047.

CU04 should cause all of the Cleanup Area temperature monitors to increase, as well as the Reactor Building exhaust and stack gas radiation levels. Only two of the eight temperature monitors track correctly, (DR 89-1-0049); to be resolved by 06/30/92.

RR16 Malfunction - Recirc Loop Break

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting up to a full double ended shear of the reactor recirc piping, (Equivalent break area 4.3 ft^2).

This malfunction was tested at 100%, 50 %, and 5% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Tests were ended after all required actuations/isolations occured, and reactor vessel and containment parameters were stable or under control.

Baseline data was from Updated FSAR, Sections 6.2, Containment Systems, and 6.3 Emergency Core Cooling Systems.

No deficiencies were noted.

Other malfunctions which may be used to give a Loss of Coolant, in the form of failures of safety and relief valves are: AP01, AP02, AP03 and AP04. Cause and Effects desscriptions may be referenced for each of these malfunctions to describe malfunction characteristics. One deficiency was identified, and corrected.

2. LOSS OF INSTRUMENT AIR ABSTRACTS

IA03 Malfunction - Instrument Air Header Leak

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting up to a 2500 SCFM instrument air header leak.

This malfunction was tested at 100%, 50%, and 10% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis, using P&ID's, plant procedures, and past plant experience. One deficiency was generated (89-1-0081) to track the valves that did not fail correctly due to the loss of air, this will be resolved by 06/30/92.

IA05 Malfunction - Instrument Air Leak In Containment

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a pipe failure downstream of the inboard instrument air supply check valve. A 50% rupture is equal to the capacity of the Drywell Compressor System (2 compressors). A limited supply of nitrogen is available via backup bottles.

This malfunction was tested at 100% and 45% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis, use of plant procedures, and P&ID's.

One deficiency was identified during the tests. The severity of malfunction IA05 needs to be adjusted slightly such that 25% corresponds to 1 compressor, 50% requires 2 compressors, and 100% is twice the capacity of both compressors. This deficiency is being tracked with DR 89-1-0072, and will be resolved by 06/30/92.

Other malfunctions which may be used to give a Loss of Instrument Air include: IA01, ED06C,F.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. No deficiencies apply in these malfunctions.

3. LOSS OR DEGRADED ELECTRICAL SYSTEM ABSTRACTS

ED02 Malfunction - N.S.S.T. Trip

This malfunction test was conducted in March 1989.

This malfunction inserts a tranformer differential current trip. This will trip main generator lockouts #1 and #2. Generator output breakers 5T-2 and 6T-2 trip along with the generator field breaker. The turbine trips, however, the reactor doesn't scram. The bypass valves open to control reactor pressure, and the stator cocling pumps trip.

All tests were started from 50% power, middle of core life, equilibrium Xenon, just below 100% control rod pattern, with steady state conditions. The turbine bypass valves were opened slightly, to bypass the turbine stop valve closure scram.

Baseline data was from best estimate analysis, use of plant procedures, and CWD's.

Deficiency 89-1-0012 was generated to correct two alarms associated with the lockout relay trips. The alarms did not actuate and clear correctly. This item will be resolved by 06/30/92.

ED08 Malfunction - Instrument A.C. Bus Trip

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting an instrument bus short circuit, which causes both the normal, and the backup instrument AC bus feeder breakers to trip. This results in a loss of power to all instrument AC loads. An "A" channel (half) scram occurs and moisture separator low level causes a turbine trip. Full core display indicating lights are lost, along with numerous lesser indications and control functions.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis, utilizing plant procedures, CWD's, P&ID's and electrical lead distribution lists.

Three deficiencies were identified, relating to indications and control functions. Two have been corrected; the third, tracked by SDC 88-1-0181, concerns the full core display indicating lights, and will be resolved by 06/30/92.

ED09 Malfunction - Loss of Vital AC

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting a short circuit on the Vital AC bus. This will cause the normal feeder from the Vital AC motor-generator to trip. The automatic bus transfer switches to the backup supply, which also trips. Loss of Vital AC power causes an RPS "B" half scram. The feed regulating valves lock up, as well as both reactor recirc pump MG set scoop tubes. The Rod Worth minimizer and process computer outputs are lost. Process radiation monitors lose power, causing a Rx Building Ventilation trip and SBGTS start. The electrical pressure regulator (EPR) is lost; control shifts to the mechanical pressure regulator (MPR).

The test was started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis using plant procedures, P&ID's and electrical drawings.

Two deficiencies were identified in the testing, relating to actuations and annunciation. Both have been corrected.

Other malfunctions which may be used to give Loss or Degraded Electrical Systems include: ED01, ED04, ED05, ED06, ED07, ED10, ED11, ED12, ED14 and ED15.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. In malfunction ED04, annunciation was incorrect (DR# 87-1-0184). This deficiency has been corrected.

4. LOSS OF COOLANT FLOW ABSTRACTS

RR01 Malfunction - Recirc Drive Motor Trip

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a phase to phase short in the reactor recirc MG drive motor, causing a differential overcurrent trip. The motor supply breaker and generator field breaker trip. The affected recirc pump coasts down; loop flow drops to zero in about 24 seconds, then increases slightly due to reverse flow. Both pumps were tested.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from the plant updated FSAR, Section 15.4-1, Recirculation Pump Trip. No deficiencies were identified.

RR02 Malfunction - Recirc Pump Locked Rotor

This malfunction test was conducted in April 1989.

This malfunction is capable of simulating a mechanical binding of the recirculation pump rotor. Pump motor current increases sharply, causing the MG set lockout relay to actuate. This trips the drive motor breaker and the field breaker.

All tests were started from 100% power, middle of life, equilibrium xenon, steady state conditions. The malfunction was tested on both recirc pumps.

Baseline data was from the Updated FSAR, Section 15.4.3, Recirculation Pump Seizure, and best estimate analysis. No deficiencies were noted.

Other malfunctions which may be used to give a Loss of Coolant Flow include RR03, RR05, RR06, RR07 and RR13.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. One deficiency was identified while testing RR13, with regards to flow indications. This item (DR# 89-1-0067) will be resolved by 06/30/92.

5. LOSS OF CONDENSER VACUUM ABSTRACTS

CW01 Malfunction - Circ Water Pump Trip

This malfunction test was conducted in March 1990.

This malfunction is capable of inserting an overcurrent relay trip on any of the four main circulating water pumps. In this major malfunction test, all four circ water pumps were tripped simultaneously. Testing in March, 1989 checked individual pump trips, and the associated plant response.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from the Update FSAR, Section 15.3.5, CWD's and plant procedures. No deficiencies were identified.

FW30 Malfunction - Condenser Air Inleakage

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting up to a 1000 SCFM air leak into either main condenser, due to expansion boot failure.

This malfunction was tested at 100%, 50%, and 5% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. At 5% severity, the malfuction was verified to cause a vacuum decrease, and a loss in generation output. The disolved oxygen analyzer reading increased less than expected, (DR-corrected). Condensate temperatures, conductivities, and offgas flow increased, as expected. At higher malfunction severities, the reactor scram and tubine trip on low vacuum were verified, as well as the bypass valve trip. One discrepancy occured after the turbine tripped (100% severity): Vacuum stopped decreasing. This item has also been corrected.

Baseline data was from the Updated FSAR, Section 15.3.5, Loss of Condenser Vacuum, plant procedures, and P&ID's.

Other malfunctions which may be used to give a Loss of Condenser Vacuum include CW02, CW06, CW07, and FW31 (Condenser Level Controller Failure).

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. One deficiency exists for CW06 (DR# 89-1-0046); the malfunction, when inserted, had no effect on plant performance. This will be resolved by 06/30/92.

6. LOSS OF SERVICE WATER ABSTRACTS

SW01 Malfunction - Service Water Pump Trip

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting an overload trip on any of the four service water pumps.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Testing on each pump verified the pump trip indications and annunciations, as well as decreasing cooling flow to SW loads.

Baseline data was from plant operational data, and best estimate analysis.

No deficiencies were identified.

SW02 Malfunction - Service Water Strainer Plugged

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting service water strainer blockage up to 100% (complete blockage). Blockage assumed to be from marine fouling.

This malfunction was tested at 50% severity, and slowly ramped up to 100%. The service water (SW) strainer high D/P alarm was verified, and SW discharge pressure (downstream of the strainer) decreased. Running SW pump current decreased due to decreased pump flow. Cooling water flow to the following heat exchangers was lost: RBCCW, TBCCW, TBSCCW, Diesel Generator. Associated equipment temperatures increased. The SW strainer bypass valve was opened, which restored cooling to the heat exchangers. Temperatures decreased accordingly.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from plant P&ID's, procedures, best estimate analysis, and plant experience. No deficiencies were identified.

Other malfunctions which may be used to give a Loss of Service Water include SW04 and SW05.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. No deficiencies were identified.

7. LOSS OF SHUTDOWN COOLING ABSTRACTS

SD01 Malfunction - Shutdown Cooling Pump Trip

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a motor short circuit on either shutdown cooling (SDC) pump. The resultant pump trip actuates a pump tripped by overload annunciator. Heat load on the RBCCW system decreases. The malfunction is subsequently removed, the overcurrent reset, and the pump restarted. RBCCW heat loads are verified to increase. Reactor cooldown is restored. This malfunction was tested on both pumps.

The test was started with the reactor shutdown, cooling down at 70°F/hr, middle of life, at a pressure of 170 psig.

Baseline data was from best estimate analysis, plant P&ID's and CWD's.

One deficiency was noted, in that if the overcurrent is reset without removing the malfunction, the alarm should clear and the pump lights come back on (given a start signal, it would trip again). In the simulator, the malfunction must be removed to allow reset, (DR 89-1-0115). This deficiency has been corrected.

SD05 Malfunction - Shutdown Cooling Hx Tube Leak

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting up to a 500 gpm tube leak in either SDC heat exchanger.

This malfunction was tested at 100%, 50%, and 5% severity. The malfunction was first entered at 100% severity with the SDC system lined up, but no pump running. The RBCCW surge tank low level alarm actuated 80-90 seconds after clearing the high alarm. Rx water level was observed to increase. Surge tank fill was lined up, but unable to clear the low level alarm. The A SDC pump was started, causing the RBCCW surge tank low level alarm to clear, and the high alarm to annunciate. The RBCCW radiation monitor alarmed and reactor water level decreased. The Reactor Building Floor Drain Sump A showed increased flow. Testing at the reduced severities was performed with observation of the selected parameters.

The tests were started with the reactor shutdown, ready for startup at 170°F, middle of life, equilibrium xenon, with the mode switch in shutdown.

Baseline data was from plant operating procedures, P&ID's, CWD's and best estimate analysis.

No deficiencies were noted.

RC06 Malfunction - RBCCW Header Rupture in the Drywell

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting an RBCCW leak of up to twice the surge tank makeup capacity, in the drywell piping.

This malfunction was tested at 100%, 50%, and 5% severity. At 100% severity, the RBCCW surge tank low level alarm actuation was verified, along with drywell floor drain sump Hi-Hi level. The malfunction was removed, and the alarms cleared. At the reduced severities, surge tank makeup precluded the low level alarm.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis utilizing plant procedures, P&ID's and CWD's.

No deficiencies were identified.

Other malfunctions which may be used to give a Loss of Shutdown Cooling include: SD02, SD03, and SD04.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. One deficiency report was generated to track a problem with SD02 malfunction. At 0% severity the malfunction did not restrict valve movement until after one valve cycle. Additionally, the breaker for the valve couldn't be reset without malfunction removal. These items are tracked under DR# 89-1-0114, to be resolved by 06/30/92.

8. LOSS OF COMPONENT COOLING ABSTRACTS

RC01 Malfunction - RBCCW Pump Trip

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a motor short circuit on either RBCCW pump.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Testing on both pumps verified the correct annunciation and plant response to the pump trip.

Baseline data was from best estimate analysis, using plant procedures and P&ID's.

No deficiencies were identified.

CC01 Malfunction - TBCCW Pump Trip

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting a motor short circuit which trips the instantaneous overcurrent, to trip the breaker for a given TBCCW pump.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Each pump was tested to verify proper annunciation and overall plant response. Main turbine auxiliaries, which are cooled by TBCCW exhibited the required temperature rise upon loss of the cooling water pump.

Baseline data was from best estimate analysis, using plant procedures and technical manuals.

No deficiencies were identified.

SC03 Malfunction - Loss of Cooling to a Condensate Pump Cooler.

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a variable loss of cooling flow (100% = total loss) to any of the three condensate pumps.

This malfunction was tested at 100%, 50%, and 5% severity. When bearing flow through the cooler decreased to 2gpm, the low flow alarm actuated. Affected condensate pump bearing temperatures increased, actuating a bearing high temperature alarm. Motor current increased due to increased bearing resistance, and the pump tripped on overcurrent. When the malfunction was then cleared, and the bearings cooled off, the condensate pump tripped during start attempts, due to wiped bearings.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis, based on plant P&ID's, Technical Manuals, and procedures.

One deficiency was noted during testing. The rate of bearing temperature rise was too great. This item has been corrected.

SC06 Malfunction - TBSCCW Header Leak at Hx Outlet

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a TBSCCW header leak that is double the surge tank makeup flow rate. The leak is at the heat exchanger outlet, and flows into turbine building air compressor sump. At large severity, the TBSCCW surge tank low level alaram actuates, followed by the local sump alarm. As conditions continue to degrade, components cooled by TBSCCW start to heat up. The malfunction is subsequently removed, and the surge tank level restored.

This malfunction was tested at 100%, 50%, and 5% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis, based on plant procedures, P&ID's and CWD's.

Deficiencies found during this test are tracked by DR 89-1-0109:

1) Wnen the system was drained, the pump still had significant discharge pressure.

2) Immediately after malfunction entry, the area sump alarm actuated. Alarm actuation should be delayed.

3) The leak size is about 100gpm, system pump capacity is 1800 gpm. Immediately after malfunction insertion, the feed string bearing coolers low cooling flow alarms occur. A time delay will be provided.

These items will be resolved by 06/30/92.

Other malfunctions which may be used to give a Loss of Component Cooling include: RC03, RC04, RC05, RC08, SC01, SC02, SC04, SC05, CC02, CC03, CC04, CC05 and CC07.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. For RBCCW system malfunctions, one deficiency was identified; system leaks in excess of makeup capacity had no effect on system performance. DR# 89-1-0095 applies, and is to be resolved by 06/30/92.

For SSCW system malfunctions, the Cond Booster Pump Overload of Fault Trip alarm and RFP Overload or Fault Trip alarm did not actuate at the required setpoints. These items will be corrected under DR# 89-1-0103 and 89-1-0104, by 06/30/92.

For TBCCW system malfunctions, the sump alarms did not actuate as expected; DR# 89-1-0040, to be corrected by 06/30/92.

With a loss of TBCCW to the generator H_2 cooler the generator leads temperatures did not respond correctly; DR# 89-1-0041 applies, to be resolved by 06/30/92.

9. LOSS OF NORMAL FEEDWATER ABSTRACTS

FW22 Malfunction - Feedwater Controller Automatic Failure

This malfunction test was conducted in March 1989.

This malfunction is capable of failing the FRV's in any position from zero to 100% open.

This malfunction was tested at 100%, 50%, and 5% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from P&ID's, CWD's, and best estimate analysis.

No deficiencies were identified.

FW23 Malfunction - Feedwater Control Valve Oscillations

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting feed regulating, valve oscillations of up to 50% of valve position, on either FRV.

This malfunction was tested at 100%, 50%, and 10% severity. Both FRV's were tested. At 10% severity, the valve oscillated at 5% above and below normal position, with a 5 second period. When the controller was placed in manual, oscillations continued. When severity was increased to 100%, with the valve in Auto, oscillations increased, as anticipated. Reactor water level decreased, since the average feed flow was less than required. The malfunction was removed, and level stabilization noted.

All tests were started from 100% power, middle of life, equilibrium xenon, steady state conditions.

Baseline data was from best estimate analysis, based on plant procedures, valve technical manuals, P&ID's, and CWD's.

No deficiencies were noted.

Other malfunctions which may be used to give a Loss of Normal Feedwater include: FW02, FW15 and FW32.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. No deficiencies were identified in the testing.

10. LOSS OF FEEDWATER (NORMAL & EMERGENCY) ABSTRACTS

FW01 Malfunction - Condensate Pump Trip

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting a short circuit on the designated condensate pump motor (A,B, or C). The instantaneous overcurrent device causes the breaker to trip. Associated condensate pump trip alarms actuate. Combined condensate pump discharge pressure decreases slightly, but the plant continues to operate normally. With the malfunction inserted, the pump cannot be restarted. After the malfunction is removed, the pump is restored to normal operations.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. All three condensate pumps were tested.

Baseline data was from plant experience, procedures, P&ID's and CWD's.

No deficiencies were identified in this test sequence.

FW17 Malfunction - Reactor Feed Pump Trip

This malfunction test was conducted in March 1989.

This malfunction is capable of tripping the selected feed pump by inserting an overload trip. The standby pump will automatically start, to maintain reactor water level. All three pumps were tested.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. The tests verified the proper pump trip indications, and subsequent startup of the standby pump.

Baseline data was from the Updated FSAR, Section 15.3.6, Loss of Feedwater Flow, and best estimate analysis.

No deficiencies were identified.

Other malfunctions which may be used to give a Loss of Feedwater (Normal and Emergency) include: FW07, FW08, FW19 and FW27.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. During Feedwater malfunctions testing, the following deficiencies were identified: With condensate, booster or Rx feed pump breaker control power removed, a motor overcurrent fault trip malfunction should trip the bus feeder breaker (but doesn't). DR# 89-1-0056 applies, and will be resolved by 06/30/92.

A feedwater header rupture inside primary containment results in an excessive rate of Rx vessel depressurization. Additionally, drywell radiation monitor response is erroneous. These items are documented in DR# 89-1-0061 and 89-1-0080 respectively, and will be resolved by 06/30/92.

11. LOSS OF PROTECTIVE SYSTEM CHANNEL ABSTRACT

RP04 Malfunction - ATWS Panel 1 Loss of Power

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a loss of power to the ATWS Division I or Division II Panels. Each panel was tested separately.

The tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Upon malfunction activation, the meters indicated downscale and panel lights extinguished due to the loss of power. The "ATWS RPT Failure Division I (II)" alarm actuated. No protective functions occurred. The malfunction was removed, and the system reset, per procedure. No trips occur during power restoration unless an actual trip condition exists.

Baseline data was from utilization of CWD's and plant procedures.

No deficiencies were identified in this malfunction test.

Other malfunctions which may be used to give a Loss of Protective System Channel include: RP05, RP06 and RP07.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. No deficiencies were identified.

12. CONTROL ROD FAILURES ABSTRACTS

RD01 Malfunction - All Rods Stuck At Present Position

This malfunction test was conducted in April 1989 and in April 1990 as a major malfunction.

This malfunction is capable of physically holding all control rods at their present positions. The malfunction was tested with a group 1 isolation and with the main turbine available. In both cases boron was injected to effect the shutdown.

All tests were started from 100% power, middle of life equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis. No deficiencies were identified in the testing.

RD05 Malfunction - Control Rod Blade Stuck At Present Position

This malfunction test was conducted in April 1989.

This malfunction is capable of sticking the specified control rod at its present position. When rod motion is attempted, CRD stall conditions are indicated. When the reactor is scrammed, the affected rods do not move.

All tests were started from 170°F, middle of life, ready for startup, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate ananlysis based on plant procedures, technical manuals, and P&ID's.

No deficiencies were identified with this malfunction.

RD06 Malfunction - Control Rod Uncoupled

This malfunction test was conducted in March 1989.

This malfunction is capable of allowing a control rod to withdraw beyond notch 48, and into the overtravel position. This causes the "Rod Overtravel" annunciator, and a blank rod position indication. The rod is driven in, then fully withdrawn; it remains uncoupled. The malfunction is removed and the rod inserted two notches. Upon subsequent withdraw, the rod is coupled.

All tests were started from 170°F, middle of life, plant ready for startup, equilibrium Xenon, steady state conditions.

Baseline data was from plant procedures, technical manual information, and P&ID's.

Two deficiencies were identified in the course of this testing:

1) When the rod was inserted, after malfunction removal, two notches were not sufficient to couple the rod (DR 89-1-0092).

2) When the malfunction is placed on a rod at position 48, the rod didn't drift out to the overtravel position (DR 89-1-0090).

These deficiencies will be corrected by 06/30/92.

Other malfunctions which may be used to give Control Rod Failures include: RD03, which causes rod drifts, RD04, RD07, RD08 and RD21.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction charateristics. No deficiencies were identified in the testing.

13. INABILITY TO DRIVE CONTROL RODS ABSTRACTS

RD16 Malfunction - CRD Pump Loss of Control Power

This malfunction test was conducted in April 1989.

This malfunction is capable of blowing the fuses in the 125VDC control power supply to the CRD pump breaker. This will cause the pump status lights to go out. If the pump is running, it cannot be tripped. If stopped, it cannot be started.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from plant procedures and CWD's.

A deficiency was noted in that the malfunction did not remove the "A" pump control power. Pump indicating lights functioned and the pump was able to be tripped. Also, without control power to CRD, the pump overcurrent should trip the bus feeder, but didn't. This item falls under DR 89-1-0086, and will be corrected by 06/30/92.

Other malfunctions which may be used to give an Inability to Drive Control Rods inlcude: RD09, RD17, RD19 and RD22.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. During control rod malfunction testing, when a substitute rod position is inserted into the RWM, the plant process computer doesn't display this information. DR# 89-1-0085 applies, and will be resolved by 06/30/92. With a CRD header rupture inserted (RD22) the local drain sump did not show increased flow; DR# 89-1-0096 applies; to be resolved by 06/30/92.

14. FUEL CLADDING FAILURE ABSTRACT

CR01 Malfunction - Fuel Cladding Failure

This malfunction test was conducted in May 1989.

This malfunction is capable of inserting a variable fuel cladding failure, with 100% = 100,000 μC/sec.

This malfunction was tested at 1% severity and then slowly ramped up to 100%.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis, and NUSCO Rad Assessment data.

No deficiencies were identified in this test.

15. TURBINE TRIP ABSTRACTS

TC08 Malfunction - Turbine Trip

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting a turbine emergency governor trip, caused by a trip valve latch failure. The test was deemed satisfactory after verification of the turbine trip, bypass valve actuation, reactor scram and generator trip. With the malfunction still inserted, the trip could not be reset. After malfunction removal, the governor was reset normally.

The test was started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from the updated FSAR, Section 15.3.3, Turbine Trip.

No deficiencies were identified in this test.

Other malfunctions which may be used to give a Turbine Trip include TU06.

Cause and Effects descriptions may be referenced for this malfunction to describe malfunction characteristics. No deficiencies were encountered in this testing.

16. GENERATOR TRIP ABSTRACTS

EG01 Malfunction - Generator Trip

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting a spurious differential overcurrent trip.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from plant operational data, and best estimate analysis.

Two deficiencies were identified in this testing. One is corrected, the other, which relates to the generator leads temperature alarm (89-1-0031), will be corrected by 06/30/92.

EG04 Malfunction - Main Generator Field Breaker Trip

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting a short circuit in the main generator field breaker open relay. The field breaker opens, causing a loss of excitation. The turbine master trip solenoid trips on loss of excitation. The testing verified the trip of generator lockout relays, output breaker trip, turbine trip and the reactor scram.

The tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from plant procedures, best estimate analysis and CWDs.

No deficiencies were identified.

17. FAILURE OF AUTOMATIC CONTROL SYSTEM ABSTRACTS

RR08 Malfunction - Recirc System Master Controller Failure

This malfunction test was conducted in April 1989.

This malfunction is capable of failing the reactor recirc system master controller to an instructor specified value. The controller may be ramped to the new position over any desired time interval. If the individual controllers are placed in manual, the student may regain control of recirc pump speed.

This malfunction was tested at 100%, 50%, and 0% severity. During testing, the recirc pump speed and reactor power were verified to follow the malfunction demand. With the malfunction inserted, the master controller had no affect on pump speed.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from the updated FSAR, Section 15.5.3, Recirculation Flow Controller failure, Increasing Flow.

One deficiency was identified, in that when the malfunction is entered, the controller inserts step changes to recirc pump speed, and not a smooth ramp (DR 89-1-0070). This item will be resolved by 06/30/92.

RR09 Malfunction - Recirc Pump Loop Speed Controller Failure

This malfunction test was conducted in April 1989.

This malfunction is capable of failing an individual recirc loop speed controller to any instructor desired position. If feedwater flow is below 20%, the loop speed controller output is not limited, but the input to the pump speed controller is held to 32%.

This malfunction was tested at 100%, 1%, and 0% severity. At the 1% severity, the recirc MG speed decrease was observed, along with the flow and power decrease. At 0%, the controller dropped to zero, the speed control signal failure alarmed, and the scoop tube locked up as expected. At the 100% severity, the RRMG speed, flow and Rx power increased to follow severity. Both controllers were tested.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis.

No deficiencies were identified.

RR10 Malfunction - Recirc Pump Speed Failure

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting an electronic failure into a recirc pump basic speed controller. This malfunction is similar to RR09, except that there are no limits on the rate of change of speed controller output. Controller output indication is lost, however recirc pump speed response can be observed. Low feedwater flow has no effect on this malfunction.

This malfunction was tested at 100%, 50%, and 0% severity. The speed controller did not change the speed controller output indication. The RRMG speed, loop flow, and Rx power changed to follow the malfunction severity. With a Rx scram, and feed flow below 20%, the unaffected RR pump ramped down, as required. The affected pump did not ramp downward until malfunction removal.

All testr were started from 100% power, middle of life, equilibrium Xenon, steady stace conditions.

Baseline data was from best estimate analysis.

No deficiencies were identified.

Other malfunctions which may be used to give a Failure of Automatic Control Systems include: RR11, RR12 and RW01.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. No deficiencies were identified in the testing.

18. FAILURE OF REACTOR COOLANT PRESSURE AND VOLUME CONTROL SYSTEMS ABSTRACTS

This malfunction type is applicable to PWR's only.

19. REACTOR TRIP MALFUNCTION ABSTRACTS

RP01 Malfunction - Spurious Reactor Scram

This malfunction test was conducted in April 1989.

This malfunction inserts an unidentified suprious reactor scram signal. There are no indications of the cause of the scram. With the malfunction inserted, the scram cannot be reset.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from plant data, and best estimate analysis.

No deficiencies were identified.

Other malfunctions which may be used to give a Reactor Trip include: RR18, RR19, RP05 and RP06.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. Testing RR18 revealed that as RWL decreased, the level indication erroneously came off the high peg. This deficiency has been resolved. No other deficiencies were identified for these malfunctions.

20. MAIN STEAM LINE AND FEED LINE BREAK ABSTRACTS
(Inside & Outside Containment)

MS02 Malfunction - Steam Rupture Inside Drywell, Downstream of MSIVs

This malfunction test was conducted in May 1989.

This malfunction is capable of inserting a pipe rupture immediatley downstream of the inboard MSIV, in any of the four main steam lines. The leak rate is variable, with 100% equal to 15 E6 lbm/hr. Note that each steam line flow restrictor limits flow to 3.75 E6 lbm/hr in each steam line.

This malfunction was tested at 100%, 50%, and 5% severity. All four steam lines were tested.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions, and ended when reactor water level was stable, with drywell pressure decreasing, due to steam condensation.

Baseline data was from the updated FSAR, Section 6.2 Containment Systems and Section 15.7.3 Main Steam Line Break Outside of Containment. A previously documented deficiency (88-1-0202) related to the Drywell radiation level response was noted in the testing.

This item will be dispositioned by 06/30/92.

MS04 Malfunction - Main Steam, Line Rupture In Heater Bay

This malfunction test was conducted in June 1989.

This malfunction is capable of inserting up to a 25.9 E6 lbm/hr leak from the "b" main steam line entering the bypass valve chest.

This malfunction was tested at 100%, 50%, and 5% severity.

All tests were started from 100% power, middle of life, equilibrium xenon, steady state conditions.

Baseline data was from best estimate analysis.

The testing revealed that the stack radiation monitor readings decrease too rapidly after event initiation. The area radiation monitor closest to the break does not read as high as a nearby monitor. These items are being tracked under DR 89-1-0170, and will be corrected by 06/30/92.

Other malfunctions which may be used to give a Main Steam Line or Feed Line Break include: MS03, FW18 and FW19.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. Testing of MS03 reveal 3 deficiencies: The steam tunnel steam line break caused shutdown cooling pump room radiation levels to erroneously peg high; DR# 89-1-0169 will be resolved by 06/30/92.

The steam tunnel temperatures during the steam line break were excessive; DR# 89-1-0037, for resolution 06/30/92.

One steam tunnel temperature monitor appears to be simulated in the wrong location; DR# 89-1-0167 applies, for resolution 06/30/92.

Malfunctions FW18, FW19 were previously discussed.

21. NUCLEAR INSTRUMENTATION FAILURE ABSTRACTS

NI01 Malfunction - APRM Failure

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a failure on any of the 6 APRM channels; a severity of 100% results in an output of 125 (full scale).

This malfunction was tested at 100%, 87%, and 0% severity, on each of the six channels.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Tests were ended after each malfunction was verified to cause the required upscale and downscale trips, as well as proper recorder response.

Baseline data was from best estimate analysis, using plant procedures and CWD's.

No deficiencies were noted in this testing.

NI02 Malfunction - IRM Failure

This malfunction test was conducted in April 1989.

This malfunction is capable of failing any of the 8 IRM channels to an instructor desired indication. A 100% severity indicates 125 on the scale.

This malfunction was tested at 100%, 87%, and 0% severity on each IRM channel.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Tests were ended after each malfunction caused the proper upscale and downscale trips, with associated recorder response.

Baseline data was from best estimate analysis, using plant procedures, surveillances and CWD's.

No deficiencies were identified.

Other malfunctions which may be used to give a Nuclear Instrumentation Failure include: NI03, NI04, NI05, NI06 and NI10.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. Ramp insertion of NI03 causes step jumps in SRM output and period; DR# 89-1-0068. This DR was corrected.

22. PROCESS INSTRUMENTATION FAILURE ABSTRACTS

RM01 Malfunction - Process Monitor Readings

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a detector failure of up to 100% of the process range, into any of the 20 process radiation monitors.

This malfunction was tested at 100% and 0% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions, and ended when all expected alarms were received.

Baseline data was from best estimate analysis, utilizing plant procedures and drawings.

When a downscale signal was applied to the Stack Gas Radiation monitor, an alarm should have actuated, but did not (DR 89-1-0099). The downscale lights on the RBCCW and SW Radiation monitors did not require a "reset" prior to clearing, (DR 89-1-0098). These items have been corrected.

RM02 Malfunction - Area Radiation Monitor Failure

This malfunction test was conducted in April 1989.

This malfunction is capable of inserting a detector failure, resulting in a given ARM indication of 0 to 100% of indicated range.

This malfunction was tested at 100% and 0% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from best estimate analysis.

Deficiency Report 89-1-0100 was initiated on ARM #12, the Drywell High Range Monitor. The malfunction did not affect this monitor, which was recently relocated. This deficiency has been corrected.

FW26 Malfunction - FWCI Auto Start Failure

This malfunction test was conducted in March 1989.

This malfunction is capable of blocking the auto start capability of the feedwater coolant injection system, by simulating a blown fuse in the start circuitry.

Testing was started during a scram recovery, with the reactor slightly subcritical, 8 hours after a scram from 100% power. Drywell pressure was increased above 2 psig by securing the drywell coolers. All other ECCS systems functioned normally. The malfunction was removed, FWCI initiated correctly.

Baseline data was from best estimate analysis using plant procedures and CWD's.

No deficiencies were identified.

Other malfunctions which may be used to give a Process Instrumentation Failure include: RM03, RR21, CC05 and CU06.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. No deficiencies were identified in this testing.

23. PASSIVE MALFUNCTIONS IN EMERGENCY SYSTEMS ABSTRACTS

CS02 Malfunction - Core Spray Pump Fails To Auto Start

This malfunction test was conducted in March 1989.

This malfunction is capable of preventing the auto start of a selected core spray pump (failed contacts).

Testing was started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Containment pressure was raised to 1.8 psig; the affected CS pump did not start, while the other pump started. The affected pump was then manually started. After simulator reset, the low-low water level actuation of core spray was also verified inhibited using this malfunction.

Baseline data was from best estimate analysis using plant CWD's and system procedures.

When the malfunction was removed, the affected pump should have auto started with an initiation signal present. This problem was intermittent (DR 89-1-0040), and will be corrected by 06/30/92.

Other malfunctions which may be used to initiate Passive Malfunctions in Emergency Systems include: LP02 and SD07.

Cause and Effects descriptions may be referenced for each of these malfunctions to describe malfunction characteristics. While testing SD07, the valve throttle light remained illuminated after the breaker tripped; DR# 89-1-0113, to be resolved by 06/30/92.

24. FAILURE OF AUTO REACTOR TRIP SYSTEM ABSTRACTS

RP02 Malfunction - Failure of All Automatic Scrams

This malfunction test was conducted in April 1989.

This malfunction is capable of preventing all automatic reactor scrams from inserting control rods. During a scram condition, the respective annunciators will occur, but with no rod motion. Manual reactor scram remains functional.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Automatic scram conditions were created (low water level, high Rx pressure, etc.), with proper annunciation, but with no rod motion. Removal of the malfunction, or a manual scram caused rod insertion.

Baseline data was from best estimate analysis, plant procedures and CWD's.

No deficiencies were identified.

RP03 Malfunction - Failure of All Automatic Scrams Except ATWS

This malfunction test was conducted in April 1989.

This malfunction is capable of preventing all automatic scrams except ATWS from causing control rod insertion. The malfunction simulates a failure of all 917/590 - 108 relays. Normal reactor protection system alarms anunciate, however, when their setpoint is reached.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. The tests verified that only the ATWS and manual scram functions caused control rod insertion.

Baseline data was from best estimate analysis, utilizing plant procedures, CWD's, and P&ID's.

During the ATWS scram, which bleeds off the scram air header, the control rods should insert in a random manner. In this testing all rods inserted at once (DR # 89-1-0094). This item will be corrected by 06/30/92.

25. REACTOR PRESSURE CONTROL SYSTEM FAILURE INCLUDING TURBINE BYPASS FAILURE (BWR) ABSTRACTS

TC01 Malfunction - Electric Pressure Regulator Transducer Failure

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting a failure of the EPR pressure transducer output ot an instructor specified valve.

This malfunction was tested at 40%, 39%, and 41% severity. At the 40% severity (based on initial pressure setpoint), there was no significant change in pressure transducer output; reactor pressure remained stable. With the severity decreased by 1%, the control valves closed slightly, causing steam pressure to increase. The mechanical pressure regulator (MPR) opened the control valves and controlled pressure at its setpoint. Upon malfunction removal, the EPR restored pressure control.

With the severity increased to 41%, control valves opened to the load limit, followed by the bypass valves, to reduce reactor pressure. When pressure decreased to 825 psig, the MSIV's shut and the Rx scrammed, as expected.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from the Updated FSAR, 15.3.1, Steam Pressure Regulator Failure (decreasing flow), technical manuals, prints and procedures.

No deficiencies were identified.

TC02 Malfunction - Electric Pressure Regulator Oscillation

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting up to a 100 psig oscillation in the EPR output signal. Oscillation period is about 3 seconds.

This malfunction was tested at 100%, 50%, and 10% severity.

All tests were started from 100% po :, middle of life, equilibrium Xenon, steady state co :ions. During testing at the higher severities, the MPR took cc .rol of pressure at the high point in the oscillations. Plant pressure, power, level, and steam flow response were verified at each severity. With the malfunction removed, the EPR pressure control returned to normal.

Baseline data was from actual plant experience during EPR oscillations, and best estimate analysis.

Testing revealed that steam flow, reactor power, and reactor water level did not oscillate with the required amplitude.

This item (DR 90-1-0039) will be dispositioned by 06/30/92.

TC03 Malfunction - Mechanical Pressure Regulator Transducer Failure

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting an MPR pressure transducer output failure to any instructor desired value. This malfunction is similar to TC01.

This malfunction was tested at 90%, 97%, and 96% severity. Since the MPR has a considerably larger pressure control range than the EPR, this malfunction is initially entered at a value of (steam press. -150) /9, in order to cause no change in controller output. The malfunction was verified by entering at 97%, which maintained normal steam pressure. When the severity was decreased by 1%, with the MPR in service, the control valves closed, steam pressure started to increase, then the EPR took control of pressure. With the EPR controlling pressure, the severity was increased by 1%. The MPR opened the control valves to the load limit, followed by opening of the bypass valves. Reducing reactor pressure caused the subsequent scram and MSIV closure on low steam pressure.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions.

Baseline data was from the updated FSAR, 15.3.1, Steam Pressure Regulator Failure (Decreasing Flow), and best estimate analysis.

No deficiencies were identified.

<u>TC04 Malfunction</u> - Mechanical Pressure Regulator Oscillation

This malfunction test was conducted in March 1989.

This malfunction is capable of inserting an MPR oscillation with a variable swing of up to 100 psig. Malfunction is similar to TC02.

This malfunction was tested at 100%, 60%, and 20% severity.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Testing was concluded after the MPR servo and pressure response to the malfunctions were verified.

Baseline data was from best estimate analysis.

The pressure swings did not equal the malfunction magnitude. This deficiency discussed under TC02 malfunction.

<u>TC05 Malfunction</u> - Turbine Control Valve Failure

This malfunction test was conducted in March 1989.

This malfunction is capable of positioning any of the control valves to a desired position.

This malfunction was tested at 100%, 50%, and 0% severity, for each control valve.

All tests were started from 100% power, middle of life, equilibrium Xenon, steady state conditions. Each control valve was tested. The non-selected valves responded to the failed valve as follows: With the selcted valve full open, other control valves modulate closed. With a valve failed shut at 100% power, the other control valves opened fully, and bypass valve flow was required to control reactor pressure.

Baseline data was from best estimates analysis.

No deficiencies were identified.

Other malfunctions which may be used to give a Reactor Pressure Control System Failure include: TC06 (Bypass Valve Failure).

Cause and Effects descriptions may be referenced for this malfunction to describe malfunction characteristics. No deficiencies were identified in the TC06 Malfunction Testing.

ATTACHMENT 6

INITIAL CONDITIONS CHECKLIST
AND LIST OF 10 CERTIFIED
INITIAL CONDITIONS

ATTACHMENT 8.1

MILLSTONE 1

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.

903	______	910	______	921	______	936	______
904	______	911	______	922A	______	937	______
905	______	913	______	922B	______	938	______
906	______	915	______	923	______	945	______
907	______	917	______	925	______	924	______
908	______	980-1	______	926	______		
909	______	980-2	______				

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.

ANR	____	CUR	____	IAR	____	RCR	____	SCR	____
APR	____	CWR	____	LPR	____	RDR	____	SDR	____
CCR	____	EDR	____	MSR	____	RMR	____	SLR	____
CRR	____	EGR	____	NIR	____	RPR	____	SWR	____
CHR	____	EXR	____	OGR	____	RRR	____	TOR	____
CSR	____	FWR	____	RCR	____	RWR	____	WDR	____

III. Initial Condition Stability and Reasonability

Perform either Section A, B or C

A. For Equilibrium Xenon, Steady State, Power Levels (30%, 50%, 75%, 100% power, etc.) only, ensure the following parameters are stable and reasonable for the first 2 minutes after resetting to the IC and going to run:

* Neutron Flux % ____
* Core Flow ____
* Reactor Pressure ____
* Rx Water Level ____
* Total Stm Flow ____
* Total FW Flow ____
* Core Thermal Pwr % ____
* Generator Load ____
* Control Rod Position is reasonable for power level ____
* Recirc Flow ____
* CRD Flow ____
* CRD Temperature ____
* RWCU Flow ____
* RWCU Inlet Temp ____
* RWCU Return Temp ____
* Xenon Reactivity from Instructor Station is in Equilibrium ____

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, unusual control rod 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:

* Neutron Flux % ____
* Core Flow ____
* Reactor Pressure ____
* Rx Water Level ____
* Total Steam Flow ____
* Total FW Flow ____
* Core Thermal Pwr % ____
* Generator Load ____
* Control Rod Position is reasonable for power level ____
* Recirc Flow ____
* CRD Total Flow ____
* CRD Temperature ____
* RWCU Flow ____
* RWCU Inlet Temp ____
* RWCU Return Temp ____
* Xenon Reactivity from Instructor Station is in Equilibrium ____

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, unusual control rod positions, unusual equipment lineups, etc.

C. For ICs in 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:

* Core Flow ____
* Reactor Pressure ____
* Rx Water Level ____
* Total Steam Flow ____
* Total FW Flow ____
* Neutron Flux % ____
* Xenon Reactivity from Instructor Station is in Equilibrium ____
* Recirc Flow ____
* CRD Total Flow ____
* RWCU Flow ____
* If SDC in operation, SDC flow is steady ____

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

IV. <u>IC Requirements to be Specifically Verified</u>

None.

1

INITIAL CONDITIONS

IC No.	Rx Temp / Press Psig	MWe NET	Rx Pwr %	Core Flow %	XE React PCM	Core Life	SNAPSHOT Time	SNAPSHOT Date	REMARKS
1	112 F	0	1E-7	0	0	BOL	08:29:53	04/11/90	ALL SYSTEMS SHUTDOWN. C
2	159 F	0	8E-8	22	0	BOL	08:23:33	04/11/90	SHUTDOWN PLANT READY FOR STARTUP..........C
3	181 F	0	1E-6	23	0	MOL	13:29:49	04/10/90	READY FOR STARTUP, 3 DAYS AFTER S/D........C
4	173 F	0	5E-7	25	0	EOL	09:15:13	04/11/90	SHUTDOWN PLANT READY FOR STARTUP COND/T...C
10	933 0	0	3	31	1	MOL	13:01:23	05/11/90	READY TO GO TO RUN OFF GAS ON XE-KR.....C
11	981 0	0	22	45	4	MOL	10:24:43	04/11/90	TURBINE READY TO ROLL. C
13	1034 0	678	100	96	100	MOL	10:38:32	04/11/90	100% POWER STEADY-STATE..........C
14	1016 0	188	29	49	141	MOL	12:52:19	05/11/90	40% POWER S/D IN PROG. C
15	1013 0	36	8	39	167	MOL	11:03:03	04/11/90	10% POWER SHUTTING-DOWN........C
29	539 0	0	1E-1	25	203	MOL	10:30:45	04/12/90	HOT STANDBY C

IC [redacted] RX PWR [redacted] CORE FLOW [redacted] TEMP/PRESS [redacted] MWE [redacted] XENON [redacted]

ATTACHMENT 7

STUDENT FEEDBACK SURVEY RESULTS

NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

MEMO

May 24, 1990
OT1-90-065

TO: MP1 Licensees

FROM: M. C. Jensen (Ext. 2611) M. C. Jensen

SUBJECT: MP1 Simulator Fidelity Evaluation Results

During February and March 1990, simulator fidelity evaluation questionnaires were distributed to all MP1 licensees. The attachment contains the results of the survey.

All comments and their associated rating have been included. The disposition of items brought to our attention is stated for your information. If you have any comments or questions about the survey results, or disposition of particular items, please call.

Some of the deficiencies identified in the summary may have an item resolution date well into the future, such as June 30, 1992. This does not mean that the item is not important, or that your concern will not be addressed for another year or so (it will probably be investigated relatively soon). This date is listed for commitment purposes. Since we presently have approximately 270 deficiencies outstanding, there has to be a priority established, such that the training benefits are maximized. Licensee input (from this survey), is highly valued in this process, and helps us to establish these priorities.

If you identify any other simulator fidelity discrepancies during the year you may use the student assessment forms provided during training to bring them to our attention. Thank you in advance for your help.

MCJ/lah

Enclosure

c: File 4.1.6.6

OS70 REV. 7-85
BP9.1

SUMMARY OF RESULTS

Surveys were distributed to all MP1 licensees and certification holders (55 total).

Each operations shift returned one completed survey, which represents the comments received from that shift. This method of data compilation was found to be much more efficient on a shift basis than submitting individual forms. Additional surveys were returned partially filled out. The comments from these were also included.

35 (44%) responses among all questions rated as N

24 (30%) responses among all questions rated as 1

11 (14%) responses among all questions rated as 2

9 (11%) responses among all questions rated as 3

1 (1%) responses among all questions rated as S

Question	N	1	2	3	S
A1	18%	73%	9%	0%	0%
A2	33%	67%	0%	0%	0%
B1	50%	17%	17%	16%	0%
C1	57%	29%	14%	0%	0%
D1	29%	28%	0%	43%	0%
E1	83%	0%	17%	0%	0%
E2	67%	17%	16%	0%	0%
F1	67%	17%	0%	16%	0%
F2	50%	33%	0%	17%	0%
G1	17%	17%	42%	16%	8%
G2	58%	14%	14%	14%	0%

N = No observable difference between simulator and actual plant.

1 = The difference between simulator and actual plant is observable but has LITTLE OR NO AFFECT on the operators actions or diagnostic ability.

2 = The difference between simulator and actual plant may cause confusion or impair the operator's ability to diagnose or take the required actions PROMPTLY.

3 = The difference between simulator and actual plant causes confusion. The difference may cause an INCORRECT DIAGNOSIS and/or cause the operator to take INCORRECT ACTIONS.

S = The difference between simulator and actual plant may not affect the operator's actions or diagnostic ability, but I FEEL STRONGLY that the difference should be corrected.

NOTE

The numerical percentages of the preceeding chart reflect the actual number of responses received. There were often multiple responses for a given category. Some categories had different ratings, for the different responses received. The categories which received an "N", may not be accompanied by a response, but are included in the chart.

A. PANELS, INDICATION AND CONTROLS

1. Did you observe any differences between the plant and the simulator regarding panels, meters, switches, lights, scales, ranges, locations, etc?

Rating	Comments
2	Plant recorder pens are now: Black pens = A monitored parameters Red pens = B monitored parameters **Response** DR written; 90-1-0025 to be resolved by 06/30/92. As of 05/14/90, the hardware analysis portion of this DR has been completed.
1	FRV position indicatic on CRP 905 different by 10% from plant, anc nere is no 10% difference between the indicators. **Response** A DR is in the process of resolution for FRV irregularities. DR# 90-1-0003 will be resolved by 06/30/92.
1	Need a real GETAC panel, not the old one. **Response** The GETAC panel installation is presently being reviewed, for funding purposes and training impact. The present panel operation is similar...controls are labeled and operated identically. Panel construction and control locations are different, however.

Rating	Comments
1	CU-2A much too big. RWCU system pressure response differs from the plant.

Response

The RWCU system is presently designed such that when the system is isolated, it remains filled. When CU-2A is opened, it causes the pressure to rapidly rise, hence the valve may "appear" larger than expected. A deficiency report is being initiated to make CU-2A appear "smaller". This item is presently being deferred until plant data (from an actual isolation and restoration) can be obtained.

1	New control rod position indication to match new plant modification desired.

Response

A deficiency report (90-1-0006) has been processed. We are presently awaiting funding for this item, which will enhance simulator fidelity.

1	The new IA system has not been installed at simulator.

The key for the A Instrument Air compressor accident/LNP start permissive is not identical to the plant key.

Response

A DR is currently being worked (DR# 89-1-0180) for the Instrument Air/Service Air modification. This item will include proper key assembly replacement, and will be resolved by 30 June 1992.

1	In the plant, SRM indicators all display > 10^6 CPS (at 100% power).

Response

Presently SRM's indicate 10^6 CPS with 100% power simulated. Deficiency 90-1-0034 has been initiated to correct this item.

<u>Rating</u> <u>Comments</u>

1 The drywell sump pumps are selected differently than in the plant. In the plant, the same letter pumps are selected.

<u>Response</u>

This item has no training impact. Shifts may select a desired sump pump combination after each simulator reset. More frequently used initial conditions now have the same letter pump selected.

1 At 100% power, we usually display 680 to 692 MWe at the plant.

<u>Response</u>

Switch check for the 100% power initial condition allows for minor reactor recirc flow differences when resetting the simulator. The operator is free to adjust power to 680 MWe as desired.

2. Did you observe any difference between the plant and the simulator regarding mimic, back shading, tags, labels, etc.?

<u>Rating</u> <u>Comments</u>

1 "A" SJAE element throttle valve V2-602 1AR-602 should be labeled V2-601 1AR-601.

<u>Response</u>

A new, correct, tag has been installed.

1 The placard concerning the bypassing of APRM's and IRM's is not installed on CRP 905.

<u>Response</u>

The tag in question has been removed from the plant because of some wording problems. When new tags are cut for the plant control room, duplicate tags are generally cut and sent to the simulator for installation. We install these tags as expeditiously as possible.

Rating   Comments

1   Cond. Booster pump switches should have yellow tape over "RFP" labels.

Response

Tape installed.

1   Lighting in simulator is brighter.

Response

Lighting levels have been adjusted slightly lower, and now have obtained operators approval. This involved switching a few lighting strings and re-measuring light intensity levels. No glare is apparent from control indications. Note - after the comment was made, more of the plant control room light strings were energized, which has made illumination levels roughly equal.

B. INFORMATIONAL AIDS

1. Did you observe any differences between the plant and the simulator regarding the availability of aids and reference materials such as procedures, forms, prints, drawings, operator aids, etc.?

Rating   Comments

3   Relocating CWD area & P&IDs to emulate plant would enhance realism. Also, keep a large table next to P&ID cabinets to allow P&ID layout area.

Response

Presently, we are attempting to obtain another P&ID cabinet, so that the simulator correctly resembles the plant. When the cabinet arrives, the CWD's and P&ID's will be relocated correctly.

Rating	Comments
2	Too few phones to operate?

Response

This problem will be corrected before June 30, 1992. A DR is written, (DR 90-1-0023) to model the simulator phones after plant phones. The new phone system being tested in the plant will require us to further upgrade the system, as resources permit.

1	There is no calculator at the C.O. desk.

Response

Calculator has been replaced.

C. AUDIBLE

1. Did you observe any difference between the plant and the simulator regarding the types and level of noise such as annunciators, printers, background, turbine, steam or incidental sounds?

Rating	Comments
1	Group II reset should have an audible click of relay resetting.
N,2	RPS trips and scram resets have no relays noises.

Response

Actual relays for CRP-915 and CRP-917 are highly desirable from a physical fidelity standpoint. Efforts to obtain funding have been intensified. The deficiency has been in effect for 2 years (DR# 88-1-0016). We are presently optimistic about the prospects of obtaining these relays within the next 2 years.

Rating	Comments
1	Printer noise is annoying.

Response

Printer noise has been measured to be nearly identical to the reference plant. The simulator background fan noise is considerably less than that of the reference plant, which makes the printers sound louder. The shift may desire to secure a selected printer.

D. COMMUNICATION

1. Did you observe any difference between the plant and the simulator regarding the amount and type of communication devices available?

Rating	Comments
3	Fix 4252 line on CRP-906 phone system.

Response

This problem is corrected.

Rating	Comments
3	Desk phones should all 3 be the same (like the plant).
1	Phones on desk need longer cords. Phone receiver on CRP 906 should be just below the non-essential header isolation valve.
3	SS needs a phone to accomplish required tasks during ONP's/EOP's.

Response

A deficiency report was submitted to upgrade simulator phones to match the plant phones, including cords. DR 90-1-0023 is presently being analyzed for hardware requirements.

Rating	Comments
1	There is nothing at the simulator that is equivalent to the radiopager console. PEOs are contacted more often by radio-pager than by any other means.

Response

The use of the Radiopager console is primarily a SSSA function. SSSA's are generally not with the shift during training sessions on the simulator. The limited training benefits do not justify the expense of obtaining a Radiopager Console. PEO's can be contacted using the phones.

E. ENVIRONMENT

1. Did you observe any differences between the plant and the simulator regarding the amount and type of normal and/or emergency lighting?

Rating	Comments
N,2	Simulator is brighter.

Response

Previously discussed under Section A.2.

2. Did you observe any differences between the amount, type and arrangement of the furniture.

Rating	Comments
1	SCO computer is not mounted as it is in the plant.

Response

This will be corrected when the PPC is accepted. DR-89-1-0181.

Rating	Comments
2	Chairs are clunkers, but you aren't in them a lot.

Response

Does not impact training.

F. PLANT COMPUTER

1. Did you observe any difference between the plant and the simulator regarding the PPC input and output devices (CRTs, keyboards, printers, etc.)?

Rating	Comments
3	Simulator lighting too bright, or increase CRT intensity for PPC.

Response

Trainees may adjust CRT intensity; reduced lighting levels (see Section A.2) have improved PPC readability.

2. Did you observe any difference between the plant and the simulator regarding the PPC functions, capabilities and responses?

Rating	Comments
1	Need 323 format (Circ's, temps, vac's) and 095 format (met tower).
N	Computer on simulator has slower response to demands.
3	PPC displays outdated.

Response

The problem will be resolved by June 30, 1992. A DR is written for the PPC upgrade. DR-89-1-0181.

G. SIMULATOR RESPONSE

1. Did you observe any simulator response which you believe to be incorrect?

Rating	Comments
1	No loss of signal failure malfunction on feed reg valves.

Response

This malfunction is being installed at this time. (DR's 90-1-0012 and 90-1-0016).

Rating	Comments
3	Power changes did not result in representative deviation on individual feed reg valves.
3,N	FRV response appears to be too slow when recirc pumps are ramped down. Response These feedwater control problems are now being analyzed by software personnel, under DR# 90-1-0003. The simulator FRV's are slightly smaller and slower than those in the plant, however not to the extent that negative training results. This problem will be resolved by June 30, 1992.
1	On EPR oscillations, reactor pressure does not change as it does in the plant. Response This item is being looked at via DR# 90-1-0039, operational data needs to be gathered, for fidelity verification. On the next recurrence of oscillations, please notify the MP1 Operations Consultant for data gathering.
S	The DG loading in the plant is about 10 times as sensitive. DG load should continue to move up slowly for up to 30-40 secs following a ≈ 1 sec switch manipulation. Peaks at about 1.5 Mw after 1 sec "increase" with switch. Response Investigation of phenomenon underway. The MP1 Operations Consultant will collect plant data, including exact times with load rates (Kw/sec, etc.) for simulator implementation.
2	With "A" FWCI string selected, "B" FWCI string starts. Response This problem has been corrected.

Rating	Comments
2	SJAE's intercondenser is separated into element 1 & 2 sides; the plant is not. Element 1 SJAE can flow through the intercondenser to Element 2 second stage. __Response__ The observation is correct. A deficiency is being processed for correction of the problem (DR# 90-1-0040). The present condition has little impact on training, since procedurally, a train is normally not lined up with an Element 1 first stage and an Element 2 second stage.
2	For 2 booster pumps operating, pump discharge pressure is 460 psig vs. 420 psig at 100% power. __Response__ Plant data taken on Jan. 8, 1990 confirms the 460 psig. The change will be implemented under DR# 90-1-0041. Adverse training impact appears to be minimal. This item will be resolved by 30 June 1993.
2	When putting on another steam load on, SJAE pressure does not dip low enough or fast enough (10-15 psig). __Response__ When placing the second stage SJAE in service, the pressure should dip more than presently modeled. Data taken during a recent startup indicates an approximate 20° drop occurs. This item will be tracked by DR 90-1-0042, for resolution by 30 June 1992.

Rating	Comments
2	On loss of "A" heater drain pump, "B" heater drain pump did not work in auto, had to place it to on.

Response

The heater drain pump logic was verified in accordance with plant CWD's. On a loss of the "A", heater drain pump, the switch for "A" must be placed in off to allow the "B" pump to operate in AUTO. This action lines up the "B" pump to the "A" level switches for correct operation. Author assumes that "A" was not placed to off; instructors should alert the trainees to this logic condition.

Rating	Comments
N	Safety reliefs close regardless of vessel pressure. Reseat pressure = Approx. 89% of set pressure.
N	Safety relief valve reseat pressure does not appear to be modeled.

Response

Relief valves in the simulator are modeled with a reseat pressure of approximately 10% below set pressure. Reseat pressure for each valve is different, even though the lift pressures on some valves are the same.

Engineering data reveals that acceptable reseat for this valve type is 89-97% of lift pressure.

2. **Was there any procedural section, step or operation you were unable to perform because of limitations of the simulator?**

Rating	Comments
2,3	RSST feed to 14H. When this breaker is open, the voltage on 14B will not indicate, when the RSST feed to 14B is closed on an LNP.
	Response
	The present deficiency report (87-1-0184) is being worked, and is almost totally implemented. Resolution will occur before June 30, 1992.
1	LPRM Hi checks cannot be performed with IC-404A.
	Response
	Problem was not reproducible. We will be alert for the possibility of this happening again in future training scenarios, for documentation and correction.

ATTACHMENT 8

OPEN DEFICIENCY REPORT LIST

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

** STATUS(OPEN=O) = O

* PRIORITY = 2

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCI PLINE	TITLE	DISPOSITION
	87-1-0075	87-1-0051	01/22/87	/ /	GILBERT		S	LPCI PP NI SEAL LEAKAGE	8 HR
PDC	90-1-0006	90-1-0006	01/22/90	/ /	J.MOFFATT		B	RPIS FULL CORE DISPLAY REPLACEMENT	
	90-1-0019	90-1-0019	02/26/90	/ /	J.ROGERS	AN	B	REPLACE WINDOW 903 A3-2(5-8) W.H.9/U-2 MAINT FIRE DET.	
	86-1-0335		10/01/86	/ /	BLONSHIELD	CC	S	PANEL I/O LISTINGS FOR STATOR WATER COOLING PANNEL INDICATIONS ARE MISNAMED AND SOME ARE MISSING (SEE DR FOR REMAINDER OF INFO)	4 HR
CER	89-1-0041	89-1-0041	[illegible]6/89	/ /	C.TABONE	CC	S	501004 GEN LEADS HEATING ON CC04	**
CER	88-1-0122	88-1-0104	07/15/88	/ /	C. TABONE	CN	S	422003 STANDBY GAS TREATMENT LO FLOW ALARM	**
CER	88-1-0125	88-1-0107	07/15/88	/ /	C. TABONE	CN	S	424009 COMMON RESET FOR AREA TEMP ALARM	**
CER	88-1-0130	88-1-0112	07/19/88	/ /	C. TABONE	CN	S	421045 "RPV BELLOW SEAL AREA HIGH TEMP" ALARM	**
CER	88-1-0133	88-1-0115	07/19/88	/ /	C. TABONE	CN	S	422020A STACK FLOW	**
CER	88-1-0134	88-1-0116	07/19/88	/ /	C. TABONE	CN	S	424003 STEAM LEAK AREA TEMPERATURES	**
	89-1-0005	89-1-0005	01/18/89	/ /	C.TABONE	CN	S	CONTAINMENT VENTILATION PRESSURE ON VENT	
OTN	89-1-0165	89-1-0165	05/22/89	/ /	C.TABONE	CN	S	DRYWELL TEMP/PRESSURE RESPONSE TO DW SPRAY	
CER	90-1-0033	90-1-0033	05/04/90	/ /	C.TABONE	CN	S	STANDBY GAS TREATMENT FLOWS/TEMP.	
	90-1-0023	90-1-0023	03/14/90	/ /	J.ROGERS	COM	H	PHONE UPGRADE, DESK AND BOARDS	
OTN	88-1-0199	88-1-0172	11/30/88	/ /	C. TABONE	CR	S	CHANGE INITIAL SRM COUNTS FOR NOL (IC-3)	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCIPLINE	TITLE	DISPOSITION
OTH	89-1-0174	89-1-0174	06/13/89	/ /	C.TABONE	CR	S	H2/O2 GENERATION DURING A LOCA	
	87-1-0096	87-1-0200	10/01/87	/ /	C. TABONE	CS	S	CORE SPRAY INJECTION PIPE BREAK WITH LOCA	48 HR
CER	89-1-0048	89-1-0048	03/23/89	/ /	C.TABONE	CS	S	502314 CS PIPE BREAK CS05 EFFECT ON DISCH. PRESS.	**
	87-1-0135	87-1-0129	11/01/86	/ /	S. GILLVERT	CU	S	C.U. SYSTEM BECOMES UNSTABLE WHEN PUT IN AUTO	
CER	89-1-0047	89-1-0047	03/23/89	/ /	C.TABONE	CU	S	502702 CLEANUP LEAK EFFECTS ON CU SYS PRESSURE	**
CER	89-1-0049	89-1-0049	03/23/89	/ /	C.TABONE	CU	S	502702 RWCU LEAK EFFECT ON TEMPERATURES	**
CER	89-1-0050	89-1-0050	03/23/89	/ /	C.TABONE	CU	S	502602 MALF. CU03 DEMIN DEPLETION DOESN'T WORK	**
CER	89-1-0161	89-1-0161	05/22/89	/ /	C.TABONE	CW	S	503702 MAIN CONDENSER TUBE RUPTURE CW04	
CER	89-1-0162	89-1-0162	05/22/89	/ /	C.TABONE	CW	S	503702 EFFECTS OF CONDENSER TUBE RUPTURE CW04	
	87-1-0100	87-1-0126	03/12/87	/ /	C. TABONE	ED	S	MODIFY ED11 TO CAUSE SINGLE BUS TRANSFER FAILURES	6 HR
	88-1-0015	88-1-0015	02/25/88	/ /	C. TABONE	ED	B	INSTALL ELECTRIC DISTRIBUTION PANELS IN CONTROL ROOM	**
CER	88-1-0147	88-1-0129	07/28/88	/ /	C. TABONE	ED	S	401503A TRANSFORMER TROUBLE ALARMS	**
CER	88-1-0150	88-1-0132	08/11/88	/ /	C. TABONE	ED	S	401181 RSST OVERCURRENT WITH MALF. ED04 OR ESST WITH ED01	**
CER	88-1-0154	88-1-0136	08/12/88	/ /	C. TABONE	ED	S	401405 VITAL AC LOGIC	**
CER	89-1-0012	89-1-0012	03/09/89	/ /	C.TABONE	ED	S	504703 GENERATOR LOCKOUT TRIPS	**
OTH	89-1-0053	89-1-0053	03/23/89	/ /	C.TABONE	ED	S	GETAC RESPONSE FOLLOWING A SLOD TRIP	
CER	90-1-0030	90-1-0030	05/04/90	/ /	J.ROGERS	ED	H	INSTALL RSST LOCKOUTS REQ'D	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCI PLINE	TITLE	DISPOSITION
OTH	90-1-0038	90-1-0038	05/08/90	/ /	C.TABONE	ED	S	ED04 AND RSST LOCKOUT TRIPS	
OTH	90-1-0043	90-1-0043	06/19/90	/ /	C.TABONE	ED	S	LNP START TIMES	
CER	88-1-0059	88-1-0044	04/05/88	/ /	C. TABONE	EG	S	472018 ADD MAIN GEN STATOR COOLANT LO-LO FLOW 908A2(9-7)	**
CER	88-1-0060	88-1-0044	04/05/88	/ /	C. TABONE	EG	S	472023 STATOR COOLING WATER TEMPERATURES	**
CER	88-1-0061	88-1-0044	04/05/88	/ /	C. TABONE	EG	S	472025 GEN STATOR & HYD PANEL LOSS OF CONTROL ALARM 907A2(5-4)	**
CER	88-1-0166	88-1-0148	08/18/88	/ /	C. TABONE	EG	S	474103 AUTO AND MANUAL ADJUST MOTORS	**
CER	88-1-0168	88-1-0150	08/19/88	/ /	C. TABONE	EG	S	474158A THE URAL CIRCUIT DOES NOT WORK	**
CER	89-1-0031	89-1-0031	03/10/89	/ /	C.TABONE	EG	S	506302 GENERATOR LEADS TEMPERATURE ALARM	**
	87-1-0106	87-1-0203	10/01/87	/ /	C. TABONE	FW	S	CONDENSATE PUMPS SHOULD ADD HEAT	8 HR **
	88-1-0077	88-1-0060	04/19/88	/ /	C. TABONE	FW	S	THE FEEDWATER SYSTEM SHOULD DRAIN [illegible] TO THE HOTWELL	**
CER	88-1-0087	88-1-0069	05/23/88	/ /	C. TABONE	FW	S	454124 DEMIN DIFFERENTIAL PRESSURE RESPONSE	**
CER	88-1-0101	88-1-0083	06/01/88	/ /	C. TABONE	FW	S	454156 FEEDWATER CONDUCTIVITY	**
OTH	88-1-0183	88-1-0165	09/22/88	/ /	C. TABONE	FW	S	EMERG. COND. TRANSFER PUMP DISCH VALVE HALF FW28	
CER	88-1-0189	88-1-0170	11/23/88	/ /	M. SCHULZ	FW	S	"B" HD PUMP TRIP LOGIC 456135	**
CER	98-1-0190	88-1-0170	11/23/88	/ /	M. SCHULZ	FW	S	"A" AND "B" LIP HTR LEVELS 456202	**
	89-1-0007	89-1-0007	02/23/89	/ /	C.TABONE	FW	S	ADD REMOTE FUNCTION TO RACK OUT SJAE BYPASS VALVE	
CER	89-1-0056	89-1-0056	03/30/89	/ /	C.TABONE	FW	S	508125 FEED/COND PUMP TRIPS WITH LOSS OF CONTROL POWER	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCIPLINE	TITLE	DISPOSITION
CER	89-1-0061	89-1-0061	03/30/89	/ /	C.TABONE	FW	S	509302 VESSEL BLOWDOWN ON FEED LINE RUPTURE	
CER	89-1-0080	89-1-0080	04/10/89	/ /	C.TABONE	FW	S	509302 FW19 FEEDWATER RUPTURE EFFECTS ON RADIATION	
CER	89-1-0103	89-1-0103	04/14/89	/ /	C.TABONE	FW	S	522602 BOOSTER PUMP OVERLOAD ALARM SETPOINT	
CER	89-1-0104	89-1-0104	04/14/89	/ /	C.TABONE	FW	S	522706 FEED PUMP OVERLOAD ALARM SETPOINT	
OTN	89-1-0205	89-1-0205	12/14/89	/ /	C.TABONE	FW	S	FEED REG VALVE FLOW CHARACTERISTIC	
OTN	90-1-0003	90-1-0003	01/22/90	/ /	C.TABONE	FW	S	FEED REG VALVE LEVEL CONTROLLER RESPONSE	
PDC	90-1-0007	90-1-0007	01/22/90	/ /	C.TABONE	FW	S	BACKUP AIR SUPPLY FOR FEED PUMP MIN FLOW VALVES	
OTN	90-1-0016	90-1-0016	01/26/90	/ /	C.TABONE	FW	S	FEED REG VALVE LOCKUP	
PDC	90-1-0017	90-1-0017	02/09/90	/ /	C.TABONE	FW	B	CHANGE O2 RECORDER - PDCRE 1-89-024	
	90-1-0024	90-1-0024	03/14/90	/ /	J.ROGERS	NW	H	REPLACE AFFECTED TAGS ON CRP 910, 925	
OTN	88-1-0170	88-1-0152	08/19/88	/ /	N. SCHULZ	IA	S	AIR LOW PRESSURE	
OTN	88-1-0171	88-1-0153	08/19/88	/ /	N. SCHULZ	IA	S	AIR RATE OF DECREASE	
CER	89-1-0071	89-1-0071	04/10/89	/ /	C.TABONE	IA	S	510904 VACUUM TRIP RESET W/O AIR PRESS.	
CER	89-1-0072	89-1-0072	04/10/89	/ /	C.TABONE	IA	S	511103 SEVERITY OF IA05 DRYWELL INST. AIR LEAK.	
CER	89-1-0081	89-1-0081	04/11/89	/ /	C.TABONE	IA	S	510903 LOW AIR PRESSURE EFFECTS ON VALVE FAILURES	
CER	89-1-0069	89-1-0069	04/10/89	/ /	C.TABONE	IN	S	514102 RBM FAILURE (N107)	
CER	89-1-0073	89-1-0073	04/10/89	/ /	C.TABONE	LP	S	512007 RESET BREAKERS AFTER OVER-CURRENT TRIP	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCI PLINE	TITLE	DISPOSITION
OTN	90-1-0010	90-1-0010	01/22/90	/ /	C.TABONE	LP	S	LOW PRESSURE PERMISSIVE FOR INJECTION VALVES	
OTN	88-1-0111	88-1-0093	06/14/88	/ /	M. SCHULZ	MS	S	HEATER REVERSE CURRENT VALVES	**
OTN	88-1-0177	88-1-0159	08/30/88	/ /	C. TABONE	MS	S	MAIN STEAM LEAD DRAIN TRAP LEVEL HIGH ALARMS	
CER	88-1-0181	88-1-0163	09/07/88	/ /	C. TABONE	MS	S	467307 "STEAM PACKING EXHAUSTER BLOWER TRIPPED" ALARM	**
CER	88-1-0187	88-1-0169	11/23/88	/ /	M. SCHULZ	MS	S	45690081 EXTRACTION STEAM LINES HIGH LEVEL ALARMS	**
CER	88-1-0188	88-1-0169	11/23/88	/ /	M. SCHULZ	MS	S	45690086 7TH AND 8TH STAGE ES NOT DRAINED / HI LEVEL ANNUNCIATORS	**
CER	88-1-0191	88-1-0170	11/23/88	/ /	M. SCHULZ	MS	S	456500 MOISTURE SEPARATOR HI LEVEL TURB TRIP	**
CER	88-1-0192	88-1-0171	11/23/88	/ /	M. SCHULZ	MS	S	LIP HTR REVERSE CURRENT VALVES 456202	**
CER	88-1-0193	88-1-0171	11/23/88	/ /	M. SCHULZ	MS	S	HIP HEATER REV CURRENT VLV LOGIC 456200	**
CER	88-1-0194	88-1-0171	11/23/88	/ /	M. SCHULZ	MS	S	HP HTR REV CURRENT VLV 456213	**
CER	88-1-0195	88-1-0171	11/23/88	/ /	M. SCHULZ	MS	S	HP HTR REVERSE CURRENT VALVE 456801C	**
CER	88-1-0196	88-1-0171	11/23/88	/ /	M. SCHULZ	MS	S	456805 HIP HTR REV CURRENT VALVE TEST SWITCH	**
CER	88-1-0197	88-1-0171	11/23/88	/ /	M. SCHULZ	MS	S	456809 IP HTR REV CURRENT VALVE	**
CER	88-1-0198	88-1-0171	11/23/88	/ /	M. SCHULZ	MS	S	LIP HTR REV CURRENT VLV TEST SW 456813	**
CER	89-1-0037	89-1-0037	03/10/89	/ /	C.TABONE	MS	S	512502 STEAM TUNNEL TEMPERATURES AFTER PIPE RUPTURE	**
CER	89-1-0159	89-1-0159	05/22/89	/ /	C.TABONE	MS	S	501702 HALF CR01 EFFECTS ON	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCI PLINE	TITLE	DISPOSITION
								MAIN STEAM LINE RADIATION	
CER	89-1-0166	89-1-0166	05/22/89	/ /	C.TABONE	MS	S	512402 EFFECTS OF MAIN STEAM LINE BREAK MS01	
CER	89-1-0167	89-1-0167	06/12/89	/ /	C.TABONE	MS	S	512602 STEAM TUNNEL TEMPERATURE MONITOR LOCATIONS	
CER	89-1-0169	89-1-0169	06/12/89	/ /	C.TABONE	MS	S	512602 STEAM TUNNEL LEAK EFFECTS ON S/D PUMP RADS	
CER	89-1-0170	89-1-0170	06/12/89	/ /	C.TABONE	MS	S	512702 EFFECT OF STEAM LINE BREAK IN HEATER BAY	
CER	89-1-0171	89-1-0171	06/12/89	/ /	C.TABONE	MS	S	512908 EFFECTS OF OVER PRESSURIZING STEAM SEAL HEADER	
SF	89-1-0193	89-1-0193	10/05/89	/ /	C.TABONE	MS	S	SJAE HEADER PRESSURE ON STM LINE BREAK	
CER	90-1-0042	90-1-0042	06/19/90	/ /	J.ROGERS	MS	S	2ND STAGE SJAE PRESSURE DROP ON STARTUP	
CER	90-1-0027	90-1-0027	04/26/90	/ /	D.HARRIS	NI	S	LPRM UPSCALE PRIOR TO REACHING FULL POWER	
CER	90-1-0032	90-1-0032	05/04/90	/ /	C.TABONE	NI	S	SRM/IRM OVERLAP	
CER	90-1-0034	90-1-0034	05/04/90	/ /	C.TABONE	NI	S	SRM READING WHEN FULLY WITHDRAWN	
CER	90-1-0035	90-1-0035	05/04/90	/ /	D.HARRIS	NI	S	SM FUNCTIONAL TEST	
CER	90-1-0036	90-1-0036	05/04/90	/ /	D.HARRIS	NI	S	IRM FUNCTIONAL TEST	
CER	89-1-0118	89-1-0118	05/10/89	/ /	M.SCHULZ	OG	S	463375 IDLE RECOMBINES PREHEATER TEMP	
CER	89-1-0120	89-1-0120	05/10/89	/ /	M.SCHULZ	OG	S	SJAE SUCTION VALVE AUTO ISOLATION SIGNAL	
CER	89-1-0121	89-1-0121	05/10/89	/ /	M.SCHULZ	OG	S	463103 GLYCOL COOLER OUTLET TEMP TOO LOW	
CER	89-1-0122	89-1-0122	05/10/89	/ /	M.SCHULZ	OG	S	463375 A AND B RECOMBINER SKIN TEMPERATURE	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCI PLINE	TITLE	DISPOSITION
CER	89-1-0123	89-1-0123	05/11/89	/ /	M.SCHULZ	OG	S	461003A STBY XE-KR CYCLIC DRYER CHILLER LINE UP	
CER	89-1-0124	89-1-0124	05/11/89	/ /	M.SCHULZ	OG	S	461004 V2-611/V2-612 AUTO OPEN	
CER	89-1-0125	89-1-0125	05/11/89	/ /	M.SCHULZ	OG	S	461013A OFF GAS FLOW VS LCV-20-2002/2005 POSITION	
CER	89-1-0126	89-1-0126	05/11/89	/ /	M.SCHULZ	OG	S	461042 OFF GAS LCV-20-1005/1002 FLOW PATH	
CER	89-1-0127	89-1-0127	05/11/89	/ /	M.SCHULZ	OG	S	461054A V2-612 VS V5-374 AND V2-611 VS V5-373 LOGIC INTERLOCK	
CER	89-1-0128	89-1-0128	05/11/89	/ /	M.SCHULZ	OG	S	461052 OFF GAS SYSTEM FLOW VS V2-616 POSITION	
CER	89-1-0129	89-1-0129	05/11/89	/ /	M.SCHULZ	OG	S	461066 V2-348/V2-349 CYCLIC DRYER BED OUTLET VALVE	
CER	89-1-0130	89-1-0130	05/11/89	/ /	M.SCHULZ	OG	S	461104 OFF GAS SYSTEM INITIAL VALVE LINE-UP	
CER	89-1-0131	89-1-0131	05/11/89	/ /	M.SCHULZ	OG	S	461106/461108 ANNUNCIATOR LOGIC	
CER	89-1-0133	89-1-0133	05/11/89	/ /	M.SCHULZ	OG	S	463107 DRAINAGE OF OFF GAS DRIP LEG	
CER	89-1-0134	89-1-0134	05/11/89	/ /	M.SCHULZ	OG	S	463107 CYCLIC DRYER OUTLET TEMP	
CER	89-1-0135	89-1-0135	05/11/89	/ /	M.SCHULZ	OG	S	463107 INCORRECT RESPONSE TO OFF GAS TEMP	
CER	89-1-0136	89-1-0136	05/11/89	/ /	M.SCHULZ	OG	S	463108 CHARCOAL TK 1A AND 2A TEMP	
CER	89-1-0138	89-1-0138	05/11/89	/ /	M.SCHULZ	OG	S	463206 TEMPERATURES FAIL TO DECREASE	
CER	89-1-0139	89-1-0139	05/11/89	/ /	M.SCHULZ	OG	S	460302 A/B AFTER COND LEVEL LOW ANNUNCIATOR	
CER	89-1-0140	89-1-0140	05/11/89	/ /	M.SCHULZ	OG	S	463375 RECOMBINER "A" INLET TEMP HIGH - LOW ANNUNCIATOR	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCIPLINE	TITLE	DISPOSITION
CER	89-1-0141	89-1-0141	05/11/89	/ /	M.SCHULZ	OG	S	463381 OFF GAS CONDENSER CONDENSES COOLING WATER LOW FLOW ANNUNCIATION	
CER	89-1-0142	8?-1-0142	05/11/89	/ /	M.SCHULZ	OG	S	463390 GAS COOLER OUTLET TEMP	
CER	89-1-0143	89-1-0143	05/11/89	/ /	M.SCHULZ	OG	S	463419 XE-KR BLDG HVAC SYSTEM INOP ANNUNCIATOR	
CER	89-1-0144	89-1-0144	05/11/89	/ /	M.SCHULZ	OG	S	463408 XE-KR VENT RAD HIGH ANNUNCIATOR	
CER	89-1-0146	89-1-0146	05/18/89	/ /	M.SCHULZ	OG	S	463308 OFF GAS CONDENSER A/B OUTLET FLOW HI-LOW ANNUNCIATOR	
CER	89-1-0147	89-1-0147	05/18/89	/ /	M.SCHULZ	OG	S	463308 RECOMBINER MAKEUP AIR FLOW	
CER	89-1-0149	89-1-0149	05/18/89	/ /	M.SCHULZ	OG	S	463328 XE-KR ELECTRIC HTR 1A/1B	
CER	89-1-0150	89-1-0150	05/18/89	/ /	M.SCHULZ	OG	S	463364 OFF GAS REHEATER AND RECOMBINER TEMPS	
CER	89-1-0152	89-1-0152	05/18/89	/ /	M.SCHULZ	OG	S	463430 OFF GAS RAD LEVEL	
CER	89-1-0085	89-1-0085	04/11/89	/ /	C.TABONE	PC	B	517902 COMPUTER DOESN'T SHOW RWM SUBSTITUTE	
OTH	89-1-0181	89-1-0181	07/19/89	/ /	C.TABONE	PC	S	UPGRADE U-1 PPC	
	86-1-0341	86-1-0049	09/24/86	/ /	A.KARIMI	PCM	S	ADD MALFUNCTION TO INSTR. STATION	6 HR
OTH	89-1-0194	89-1-0194	10/05/89	/ /	J.MOFFATT	PPC	S	RANGE EXPANSION OF COMPUTER POINTS	
CER	89-1-0095	89-1-0095	04/11/89	/ /	C.TABONE	RC	S	515800 RBCCW RESPONSE TO SYSTEM RUPTURES	
	90-1-0025	90-1-0025	03/23/90	/ /	J.ROGERS	RCD	H	RCDR POINTERS, PENS, LABELS UPGRADE	
	87-1-0086	87-1-0194	10/01/87	/ /	BLONSHIELD	RD	S	RD06 MALFUNCTION DOES NOT WORK CORRECTLY	6 HR
	87-1-0090	87-1-0125	03/09/87	/ /	C. TABONE	RD	S	CHANGE RD01	6 HR

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCI PLINE	TITLE	DISPOSITION
	87-1-0094	87-1-0198	10/01/87	/ /	C. TABONE	RD	S	RD04 WORN DRIVE PISTON SEALS	8 HR
OTH	88-1-0116	88-1-0098	07/14/88	/ /	M. JENSEN	RD	S	CRD FLOW OSCILLATIONS	**
CER	88-1-0135	88-1-0117	07/19/88	/ /	M. JENSEN	RD	S	431423 ROD DRIFT LIGHTS / ROD SPEED	**
CER	88-1-0136	88-1-0118	07/19/88	/ /	M. JENSEN	RD	S	431423 ROD DRIFT DUE TO COOLING WATER HIGH DP	**
CER	88-1-0140	88-1-0122	07/22/88	/ /	M. JENSEN	RD	S	431404 - 431421 NORMAL ROD DRIVE SPEED	**
OTH	88-1-0208	88-1-0181	12/05/88	/ /	C. TABONE	RD	S	POWER TO ROD POSITION DISPLAY ON FULL CORE DISPLAY	
	89-1-0004	89-1-0004	01/18/89	/ /	C.TABONE	RD	S	CRD FLOW PATH THROUGH FEEDWATER BREAKS	
CER	89-1-0086	89-1-0086	04/11/89	/ /	C.TABONE	RD	S	517800 LOSS OF CONTROL POWER ON ROD DRIVE PUMPS	
CER	89-1-0087	89-1-0087	04/11/89	/ /	C.TABONE	RD	S	517703 EFFECTS OF SCRAM DISCHARGE VOLUME RUPTURE	
CER	89-1-0090	89-1-0090	04/11/89	/ /	C.TABONE	RD	S	516807 ROD UNCOUPLED MALFUNCTION AT NOTCH 48	
CER	89-1-0092	89-1-0092	04/11/89	/ /	C.TABONE	RD	S	516807 RODS SHOULD COUPLE ON INSERT SIGNAL	
OTH	88-1-0202	88-1-0175	11/30/88	/ /	C. TABONE	RM	S	CONTAINMENT RAD READINGS	
CER	88-1-0211	88-1-0184	12/05/88	/ /	C. TABONE	RM	S	485124 CONT HIGH RANGE RAD MONITOR ALARM	
CER	88-1-0213	88-1-0186	12/05/88	/ /	C. TABONE	RM	S	485637 STEAM TUNNEL VENTILATION HI RAD	**
CER	88-1-0215	88-1-0188	12/05/88	/ /	C. TABONE	RM	S	485649 TURB BLDG VENT RAD MONITOR SETPOINT	**
CER	88-1-0217	88-1-0190	12/05/88	/ /	C. TABONE	RM	S	485655 XENON / KRYPTON RAD MON ALARMS	**
CER	88-1-0219	88-1-0192	12/05/88	/ /	C. TABONE	RM	S	485718 STACK GAS SAMPLE PURGE	**

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCI PLINE	TITLE	DISPOSITION
CER	88-1-0223	88-1-0196	12/05/88	/ /	C. TABONE	RM	S	485829 "STACK GAS RAD HIGH" ALARM	**
CER	88-1-0224	88-1-0197	12/05/88	/ /	C. TABONE	RM	S	485831 "STACK GAS RAD DOWNSCALE OR INOP" ALARM	**
OTH	89-1-0202	89-1-0202	11/28/89	/ /	C.TABONE	RM	S	STACK GAS RADIATION READINGS	
	87-1-0089	87-1-0124	03/09/87	/ /	C. TABONE	RP	S	RP08 SCRAM VALVES STICK	6 HR
	88-1-0016	88-1-0016	02/25/88	/ /	C. TABONE	RP	S	ADD RPS RELAYS TO 915 AND 917 TO REPLACE	
CER	89-1-0094	89-1-0094	04/11/89	/ /	C.TABONE	RP	S	519008 ATWS SCRAM OF RODS	
CER	88-1-0039	88-1-0029	03/18/88	/ /	C. TABONE	RR	S	450197 LOW OIL PRESSURE ALARM (RECIRC L.O.)	**
CER	88-1-0040	88-1-0029	03/18/88	/ /	C. TABONE	RR	S	450421 RECIRC WINDING TEMP RESPONSE TO LOSS OF COOLING	**
OTH	88-1-0204	88-1-0177	11/30/88	/ /	C. TABONE	RR	S	RECIRC CONTROLLER SATURATION	
CER	89-1-0067	89-1-0067	04/10/89	/ /	C.TABONE	RR	S	520702 RR13 RECIRC JET PUMP FAILURE	
CER	89-1-0070	89-1-0070	04/10/89	/ /	C.TABONE	RR	S	520206 SMOOTH HALF RAMP OF CONTROLLERS	
SF	89-1-0204	89-1-0204	12/14/89	/ /	C.TABONE	RR	S	INSTRUMENT TAP BREAK EFFECT ON REF LEG TEMPERATURES	
OTH	90-1-0002	90-1-0002	01/22/90	/ /	C.TABONE	RR	S	MODIFY RR10 RECIRC CONTROLLER FAILURE	
OTH	90-1-0004	90-1-0004	01/22/90	/ /	C.TABONE	RR	S	VESSEL TO CONTAINMENT DEPRESSURIZES ON LARGE BREAKS	
OTH	90-1-0014	90-1-0014	01/26/90	/ /	C.TABONE	RR	S	"RECIRC FLOW A (B) LIMIT" ALARMS	
OTH	90-1-0044	90-1-0044	06/19/90	/ /	G.STURGEON	RR	S	AUTO START OF "A" AND "B" RECIRC DC LUBE OIL PUMP	
CER	89-1-0206	89-1-0206	12/14/89	/ /	C.TABONE	RW	S	433007 RWM MESSAGE PRINT OUT	
CER	89-1-0207	89-1-0207	12/14/89	/ /	C.TABONE	RW	S	433050 RWM SHOULD APPLY ROD	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCI PLINE	TITLE	DISPOSITION
								BLOCK	
CER	89-1-0109	89-1-0109	04/14/89	/ /	C.TABONE	SC	S	522802 EFFECTS OF SC06, SCCW HEADER LEAK	
	87-1-0091	87-1-0196	10/01/87	/ /	S. GILBERT	SD	S	ADD MALF FOR SPURIOUS GRP 4 ISO. COND. SIGNAL	6 MR
CER	88-1-0035	88-1-0026	03/09/88	/ /	N. SCHULZ	SD	S	436126 UNREALISTIC TEMP INCREASE IN SDC	**
CER	88-1-0036	88-1-0027	03/09/88	/ /	N. SCHULZ	SD	S	436128 SDC TEMP RESPONSE	**
CER	88-1-0079	88-1-0062	04/27/88	/ /	C. TABONE	SD	S	484102 ISO COND HI TEMP ALARM SETPOINT	**
CER	88-1-0080	88-1-0062	04/27/88	/ /	C. TABONE	SD	S	484126 ISO CONDENSER FLOW	**
CER	89-1-0105	89-1-0105	04/14/89	/ /	C.TABONE	SD	S	523802 ISO COND TUBE RUPTURE	
CER	89-1-0113	89-1-0113	04/14/89	/ /	C.TABONE	SD	S	523704 SD07, ISO COND 1-IC-3 VALVE	
OTH	89-1-0157	89-1-0157	05/22/89	/ /	C.TABONE	SL	S	ADD AN ADDITIONAL REMOTE FUNCTION FOR SBLC INJECTION	
CER	88-1-0007	88-1-0007	02/08/88	/ /	C. TABONE	SW	S	ADD REMOTE FUNCTION TO SUPPLY SCCW HX WITH FIRE WATER (491020)	**
OTH	88-1-0117	88-1-0099	07/14/88	/ /	C. TABONE	SW	S	SERVICE WATER PUMPS CAVITATE WHEN THEY SHOULDN'T	**
CER	89-1-0044	89-1-0044	03/16/89	/ /	C.TABONE	TC	S	525807 TC09 TURBINE GOVERNOR MALF.	**
FOC	86-1-0239	87-1-0095	03/07/86	/ /	BLOOMFIELD	TU	S	INSTALL TURB BP VALVE PIPING THERMOCOUPLE RECORDER FOCR 1-22-85	**
	87-1-0110	87-1-0203	10/01/87	/ /	S. GILBERT	TU	S	STEAM SEAL PRESSURE CONTROL	6 MR **
CER	88-1-0180	88-1-0162	09/07/88	/ /	C. TABONE	TU	S	465210 TURBINE NEVER STOPS	**
CER	88-1-0182	88-1-0164	09/13/88	/ /	C. TABONE	TU	S	465307 TURBINE THRUST BEARING	**
OTH	88-1-0207	88-1-0180	11/30/88	/ /	C. TABONE	TU	S	FIRST STAGE NOZZLE TEMPS ON	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCIPLINE	TITLE	DISPOSITION
								STARTUP	
SF	90-1-0018	90-1-0018	02/15/90	/ /	C.TABONE	TU	S	TURBINE ACCELERATION METER	
CER	90-1-0039	90-1-0039	05/14/90	/ /	C.TABONE	TU	S	525102 PRESSURE CONTROL CHANGES EFFECT ON REACTOR	
	90-1-0047	90-1-0047	06/19/90	/ /	M.SCHULZ	VAR	S	320202 VALVE TIMING	
	89-1-0155	89-1-0155	05/22/89	/ /	C.TABONE	WD	S	ADD REMOTE FUNCTIONS TO PROVIDE MAKEUP FROM FIREWATER	
	86-1-0048		05/08/86	/ /	LSSD	YP	S	I/O OVERRIDE ON MULT-POINT RECORDER DID NOT WORK.	IN GENERIC INSTRUCTOR STATION UPGRADE PACKAGE - T. TALLMAN HAS IT
	86-1-0049		05/09/86	/ /	LSSD	YP	S	WHEN ENTERING A MALFUNCTION WITH A RAMP RATE, "ENTRY OF THE MALF CAUSES THE PARAMETER TO FIRST FAIL TO ZERO THEN RAMP FROM THE ZERO INDICATION TO THE REQUESTED MALFUNCTION VALVE. SHOULDN'T DROP TO ZERO FIRST, SHOULD RAMPFROMINDICATEDNORMALVALVE TO VLVE	IN SDC 86-1-0049 - INSTRUCTOR STATION UPGRADE PACKAGE
	86-1-0346	86-1-0049	10/14/86	/ /	BLONSHIELD	YP	S	INSTRUCTOR STATION FAILS TO RECOGNIZE IC-10 TAG NUMBERS	6 HR
	86-1-0347	86-1-0049	10/22/86	/ /	BLONSHIELD	YP	S	BACKTRACK FAILED TO TAKE COMPLETE "PICTURE"	
	86-1-0364	86-1-0049	11/07/86	/ /	BLONSHIELD	YP	S	PANEL IO LIST FOR 14E BKR TO SW YD NOT RECD BY COMP	6 HR
	86-1-0365	86-1-0049	11/05/86	/ /	SKIP	YP	S	PCN REMOVAL OF COMPOSITE MALFUNCTIONS	
CER	86-1-0373	86-1-0049	12/08/86	/ /	CATAUDELLA	YP	S	COMPLETE GENERIC INSTRUCTOR STATION	
	87-1-0040		01/16/87	/ /	GILES	YP	S	REMOVE ANNUNCIATORS FROM FREEZE	ON HOLD PENDING CREATION OF A COMM. TO STUDY OVERALL ENHANCEMENTS
	87-1-0195	87-1-0188	09/03/87	/ /	BLONSHIELD	YP	S	ADDITIONAL IDA ITEMS FOR	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCI PLINE	TITLE	DISPOSITION
								ISOLATIONS BYPASS	
	90-1-0022	90-1-0022	03/14/90	/ /	J.ROGERS	YP	S	MONITOR PARAMETER CONTROL TABLES INCOMPLETE	
CER	89-1-0186	89-1-0186	08/29/89	11/19/90	J.MOFFATT	RR	B	ANNUNCIATOR CHANGS PANEL 904/905	
OTH	89-1-0195	89-1-0195	10/11/89	11/20/90	J.MOFFATT	MS	S	MOISTURE SEPARATOR HI-HI LEVEL TURBINE TRIP LOGIC	
PDC	89-1-0180	89-1-0180	06/21/89	11/23/90	J.MOFFATT	IA	B	IA/SA SYSTEM MODIFICATION PDCR 1-28-88	
PDC	89-1-0153	89-1-0153	05/18/89	11/25/90	J. MOFFATT	EG	B	GAS TURBINE GOVERNOR REPLACEMENT (1-25-88)	
PDC	90-1-0037	90-1-0037	05/08/90	12/08/90	J.MOFFATT	RP	B	INSTALLATION OF KEYLOCK SWITCHES (915/917)	
PDC	89-1-0188	89-1-0188	09/11/89	03/01/91	J.MOFFATT		B	ADD NEW CONTAINMENT MONITORING INDICATORS FOR EOP'S	
* PRIORITY = 3									
CER	89-1-0197	89-1-0197	10/11/89	/ /	J.MOFFATT		H	CONTROL ROOM PANEL TAG UPGRADE	
	87-1-0009	87-1-0099	01/12/87	/ /	C. TABONE	AN	S	LOCAL ALARM ACKNOWLEDGE	30 HR **
CER	89-1-0040	89-1-0040	03/16/89	/ /	C.TABONE	CC	S	500902 SUMP ALARMS ON TBCCW HEADER LEAK	**
CER	88-1-0121	88-1-0103	07/15/88	/ /	C. TABONE	CN	S	421066 H2/02 COMMON FAILURE ALARM	**
CER	88-1-0124	88-1-0106	07/15/88	/ /	C. TABONE	CN	S	422024 STANDBY GAS TREATMENT HI MOISTURE	**
CER	89-1-0168	89-1-0168	06/12/89	/ /	C.TABONE	CN	S	501602 DRYWELL FAN DELTA TEMP	
CER	89-1-0046	89-1-0046	03/23/89	/ /	C.TABONE	CW	S	503902 CW06 LOSS OF VACUUM PRIMING	**
SF	90-1-0045	90-1-0045	06/19/90	/ /	F.TUTTLE	ED	S	24V BATTERY TROUBLE	
CER	88-1-0063	88-1-0046	04/05/88	/ /	C. TABONE	EG	S	473110 GEN LEADS TEMPERATURES	**

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCIPLINE	TITLE	DISPOSITION
CER	89-1-0058	89-1-0058	03/30/89	/ /	C.TABONE	FW	S	510402 DISSOLVED OXYGEN EFFECTS ON AIR LEAKS	
CER	89-1-0060	89-1-0060	03/30/89	/ /	C.TABONE	FW	S	509902 HI LEVELS IN HTR'S EFFECT ON FEED TEMPS	
CER	90-1-0041	90-1-0041	06/19/90	/ /	J.ROGERS	FW	S	BOOSTER PUMP DISCH. PRESS (2 PUMPS) TOO LOW	
SF	90-1-0046	90-1-0046	06/19/90	/ /	F.TUTTLE	FW	S	RX FEED PUMP SEAL WATER INJ. PRESS LOW	
	87-1-0198	87-1-0209	10/01/87	/ /	S. GILBERT	LP	S	LPCI KEEP FILL PRESSURES	**
CER	88-1-0082	88-1-0064	05/11/88	/ /	C. TABONE	LP	S	480516 LPCI SYS OTHER VALVE MOTORS OVERLOAD ALARM	**
CER	89-1-0066	89-1-0066	04/10/89	/ /	C.TABONE	LP	S	512205 LP86A,B LPCI 10 VALVE BINDING	
CER	90-1-0040	90-1-0040	06/19/90	/ /	J.ROGERS	OG	S	SIM. SJAE INTERCONDENSERS (ELEM 1, ELEM 2) NOT CROSS TIED	
CER	86-1-0342	87-1-0032	09/29/86	/ /	GILBERT	PPC	B	REPLACE PRESENT PPC WITH THE NEW COMPUTER SYSTEM	6 MR **
CER	89-1-0088	89-1-0088	04/11/89	/ /	C.TABONE	RD	S	517625 EFFECTS OF STUCK OPEN SDV DRAINS	
CER	89-1-0056	89-1-0096	04/11/89	/ /	C.TABONE	RD	S	518401 CRD HEADER RUPTURE	
CER	89-1-0097	89-1-0097	04/11/89	/ /	C.TABONE	RD	S	516506 RBEDT TEMP WITH A LEAKY SCRAM VALVE	
CER	87-1-0128		06/05/87	/ /	G. GILES	REC	H	MODIFY EXISTING BACKGROUND NOISE SYSTEM - SHOULD BE REAL TIME	ON HOLD PENDING CREATION OF A COMM. TO STUDY OVERALL ENHANCEMENTS
OTH	89-1-0191	89-1-0191	10/05/89	/ /	J.MOFFATT	RM	B	PANEL 945 - WEATHER INFORMATION RECORDERS	
OTH	89-1-0203	89-1-0203	11/28/89	/ /	C.TABONE	RP	S	LOW VACUUM SCRAM PRESS SWITCHES	
CER	88-1-0038	88-1-0029	03/18/88	/ /	C. TABONE	RR	S	430121 RECIRC DC LUBE OIL PUMP REMOTE FUNCTION STATUS	**

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCIPLINE	TITLE	DISPOSITION
OTH	88-1-0179	88-1-0161	09/06/88	/ /	C. TABONE	RR	S	RX PRESS IS LOWER THAN THE CONDENSER	
CER	89-1-0076	89-1-0076	04/10/89	/ /	C.TABONE	RR	S	521103 RECIRC MG LOSS OF CONTROL POWER WITH A FAULT	
CER	89-1-0084	89-1-0084	04/11/89	/ /	C.TABONE	RR	S	521904 ADD MALFUNCTION FOR NEW FUEL ZONE IND.	
OTH	89-1-0107	89-1-0107	04/14/89	/ /	C.TABONE	RR	S	RESPONSE TO OPENING THE HEAD VENT AT POWER	
CER	89-1-0106	89-1-0106	04/14/89	/ /	C.TABONE	SD	S	523901 SD09 ISO COND MAKE UP VALVE FAILURE	
CER	89-1-0114	89-1-0114	04/14/89	/ /	C.TABONE	SD	S	523202 SD02 DISCH VALVE FAILS MALFUNCTION	
CER	89-1-0108	89-1-0108	04/14/89	/ /	C.TABONE	SL	S	524102 STDBY LIQUID TANK LEAK (SL02)	
CER	89-1-0102	89-1-0102	04/14/89	/ /	C.TABONE	SW	S	524900 MODIFY SW07 TO FAIL 1-LPC-4 CLOSED	
CER	89-1-0116	89-1-0116	04/14/89	/ /	C.TABONE	SW	S	524500 MODIFY MALF SW03, 1-SW-9 FAILURE	
	87-1-0155	87-1-0153	07/20/87	/ /	BLONSHIELD	YP	S	CRD CHARGING PRESSURE DOES NOT READ SAME AS PI-340-3	
	87-1-0156	87-1-0153	07/15/87	/ /	BLONSHIELD	YP	S	CAEP STOPS IF ANY OTHER CONTROL PAGE IS SELECTED	XFER SDC 86-1-0049 MEMO 6/7/88.
	87-1-0157	87-1-0153	07/15/87	/ /	BLONSHIELD	YP	S	TRAINEE PERFORMANCE REVIEW STOPS WHEN ANOTHER CONTROL PAGE IS SELECTED	XFER SDC 86-1-0049 MEMO 6/7/88.
	87-1-0158	87-1-0153	07/20/87	/ /	BLONSHIELD	YP	S	CURSOR ON CONTROL SCREEN JUMPS FROM SELECTED TAB	
	87-1-0159	87-1-0153	07/15/87	/ /	BLONSHIELD	YP	S	MALI RD12 IS INCORRECTLY LABELED AT INST. STATION	XFER SDC 86-1-0049 MEMO 6/7/88
	87-1-0160	87-1-0153	07/15/87	/ /	BLONSHIELD	YP	S	CRD DRIVE WTR P CONTROL VALVE CAN'T BE USED IN I/O IVERRIDE	XFER SDC 86-1-0049 MEMO 6/7/88.
	87-1-0197	87-1-0190	09/08/87	/ /	R. PAYTON	YP	S	IO OVERRIDE DISPLAY	

DEFICIENCY TRACKING SUMMARY
MILLSTONE UNIT 1
(OPEN DR'S BY PRIORITY/DATEDUE/LSSDSYS)

ORIGIN	DR NO	SDC NO	DATE	DATE DUE	ORIGINATOR	LSSD SYS	DISCIPLINE	TITLE	DISPOSITION
PDC	87-1-0037	87-1-0026	01/14/87	12/12/88	GILBERT	ED	B	REPLACE GETAC WITH RFL CABINET 80 HR ** PDCR 84-1-030	

ATTACHMENT 9

SCHEDULE FOR NEXT FOUR YEARS OF TESTING

ATTACHMENT 8.1

MILLSTONE 1

PERFORMANCE TEST

SCHEDULE

	START	END
Performance Test:	1 JUL 1990	30 JUN 1994
Year One:	1 JUL 1990	30 JUN 1991
Year Two:	1 JUL 1991	30 JUN 1992
Year Three:	1 JUL 1992	30 JUN 1993
Year Four:	1 JUL 1993	30 JUN 1994

APPROVED BY: M.C. Jensen
ASOT

YEAR ONE

TEST

Annual Operability NSEM-4.09	Date	Initials
50% Steady State Accuracy	______	______
80% Steady State Accuracy	______	______
100% Steady State Accuracy	______	______
100% Stability	______	______
Transient #1: Manual Scram	______	______
Transient #2: Loss of Feedwater	______	______
Transient #3: MSIV Closure	______	______
Transient #4: Turbine Trip	______	______
Transient #5: Maximum Power Ramp	______	______
Transient #6: Trip of Both Recirculation Pumps	______	______
Transient #7: Trip of One Recirculation Pump	______	______
Transient #8: Maximum Credible Accident (LOCA)	______	______
Transient #9: Main Steam Line Break	______	______
Transient #10: Isolation, Stuck SRV, Feedwater Failure	______	______
Physical Fidelity Verification (NSEM-4.12)	______	______
System Tests NSEM-4.01		
Control Rod Drive System Test	______	______
Circulating Water System Test	______	______
Instrument Air System Test	______	______
Reactor Building Closed Cooling System Test	______	______
Reactor Protection System Test	______	______
Reactor Recirculation System Test	______	______

TEST

System Tests NSEM-4.01 Cont.	Date	Initials
Service Water System Test		
Turbine Building Closed Cooling System Test		
Major Malfunction Tests NSEM-4.04		
ED11 Loss of Normal Power (Fast Transfer to RSST Failure)		
ED14 Loss of 345KV Transmission (Load Reject)		
IA03 Loss of Instrument Air		
RC01 Loss of Reactor Building Closed Cooling Water		
Malfunctions NSEM-4.05 (Listed by System)		
Circulating Water System - CW		
Control Rod Drive System CRD		
Instruments Air System - IA		
Reactor Building Closed Cooling Water System - RBCCW		
Reactor Protection System - RP		
Reactor Recirculation System - RR		
Service Water System - SW		
Turbine Building Closed Cooling Water System - TBCCW		

YEAR TWO

TEST

Annual Operability NSEM-4.09	Date	Initials
50% Steady State Accuracy	______	______
80% Steady State Accuracy	______	______
100% Steady State	______	______
100% Stability	______	______
Transient #1: Manual Scram	______	______
Transient #2: Loss of Feedwater	______	______
Transient #3: MSIV Closure	______	______
Transient #4: Turbine Trip	______	______
Transient #5: Maximum Power Ramp	______	______
Transient #6: Trip of Both Recirculation Pumps	______	______
Transient #7: Trip of One Recirculation Pump	______	______
Transient #8: Maximum Credible Accident	______	______
Transient #9: Main Steam Line Break	______	______
Transient #10: Isolation, Stuck SRV, Feedwater Failure	______	______
Physical Fidelity Verification (NSEM-4.12)	______	______
System Tests NSEM-4.01		
Automatic Pressure System Test	______	______
Core Spray System Test	______	______
HVAC/Containment System Test	______	______
Low Pressure Coolant Injection System Test	______	______
Reactor Water Cleanup System Test	______	______
Standby Liquid Control System Test	______	______
Main Steam System Test	______	______

YEAR TWO

TEST	Date	Initials
Major Malfunction Tests NSEM-4.04		
CH01 - Drywell Cooler Failure (Loss of Drywell Cooling)		
CR01 - Fuel Cladding Failure		
CW04 Main Condenser Tube Rupture (Chloride intrusion)		
SW01 - Service Water Pump Trip (Loss of Service Water)		
Malfunction Tests NSEM-4.05 (Listed by System)		
Automatic Pressure System - AP		
Cleanup System - CU		
Core Spray - CS		
HVAC/Containment System - CH		
Low Pressure Coolant Injection System - LP		
Main Steam System - MS		
Standby Liquid Control - SLC		

YEAR THREE

TEST

	Date	Initials
50% Steady State Accuracy	________	________
80% Steady State Accuracy	________	________
100% Steady State Accuracy	________	________
100% Stability	________	________
Transient #1: Manual Scram	________	________
Transient #2: Loss of Feedwater	________	________
Transient #3: MSIV Closure	________	________
Transient #4: Turbine Trip	________	________
Transient #5: Maximum Power Ramp	________	________
Transient #6: Trip of Both Recirculation Pumps	________	________
Transient #7: Trip of One Recirculation Pump	________	________
Transient #8: Maximum Credible Accident	________	________
Transient #9: Main Steam Line Break	________	________
Transient #10: Isolation, Stuck SRV, Feedwater Failure	________	________
Physical Fidelity Verification (NSEM-4.12)	________	________
Normal Plant Evolutions NSEM-4.10		
Approach to Criticality	________	________
Plant Heatup	________	________
Plant Startup to Rated Power	________	________
Power Operation	________	________
Scram and Recovery	________	________
Planned Shutdown to Hot Standby or Hot Shutdown	________	________
Plant Cooldown to Cold Shutdown	________	________

YEAR THREE

TEST

Normal Plant Evolutions NSEM-4.10 Cont.	Date	Initials
Surveillance Testing	________	________

NOTE: Individual surveillance tests are performed during normal operations.

System Tests NSEM-4.01		
Condensate/Feedwater System Test	________	________
Electrical Distribution System Test	________	________
Electrical Generation System Test	________	________
Nuclear Instrumentation System Test	________	________
Turbine Building Secondary Closed Cooling Water System Test	________	________
Turbine System Test	________	________

Major Malfunction Tests NSEM-4.04		
CC01 Loss of Turbine Building Closed Cooling Water	________	________
CC08 Loss of Stator Cooling, Generator Load Runback	________	________
CW01 Loss of Vacuum	________	________

Malfunctions NSEM-4.05 (Listed by System)		
Condensate/Feedwater System	________	________
Electrical Distribution/Generator System ED/EG	________	________

YEAR THREE

TEST

Malfunctions NSEM-4.05 (Listed by System) Cont.	Date	Initials
Nuclear Instrumentation System - NI		
Secondary Closed Cooling Water System - SC		
Turbine Control System - TC		
Turbine System - TU		

YEAR FOUR

TEST	Date	Initials
50% Steady State Accuracy	______	______
80% Steady State Accuracy	______	______
100% Steady State Accuracy	______	______
100% Stability	______	______
Transient #1: Manual Scram	______	______
Transient #2: Loss of Feedwater	______	______
Transient #3: MSIV Closure	______	______
Transient #4: Turbine Trip	______	______
Transient #5: Maximum Power Ramp	______	______
Transient #6: Trip of Both Recirculation Pumps	______	______
Transient #7: Trip of One Recirculation Pump	______	______
Transient #8: Maximum Credible Accident	______	______
Transient #9: Main Steam Line Break	______	______
Transient #10: Isolation, Stuck SRV, Feedwater Failure	______	______
<u>Physical Fidelity Verification (NSEM-4.12)</u>	______	______
<u>System Tests NSEM-4.01</u>		
Reactor Core System Test	______	______
Augmented Off-Gas System Test	______	______
Process Computer System Test	______	______
Radiation Monitoring System Test	______	______
Shutdown Cooling System Test	______	______
Waste Disposal System Test	______	______

YEAR FOUR

TEST

Major Malfunction Tests NSEM-4.04	Date	Initials
RD01 - All Rods Fail to Scram (ATWS)		
SC01 Loss of Secondary Closed Cooling Water		
TC06 - Bypass Failure, Turbine Trip		
Malfunctions NSEM-4.05 (Listed by System)		
Off-Gas System - OG		
Process Computer System - PPC		
Reactor Core System - RC		
Radiation Monitoring System - RM		
Shutdown Cooling System - SP		
Waste Disposal System - WD		

ATTACHMENT 10

ANNUAL OPERABILITY TRANSIENT TESTING ABSTRACTS

This attachment is referenced by Section 5
of the Performance Test Summary

YEARLY OPERABILITY TRANSIENT TESTING ABSTRACTS

The following 10 transients were all run in December, 1988. 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 Scram

As required by ANSI/ANS 3.5 (1985) Appendix B, a manual reactor scram was performed from 100% power, steady state (Middle of Life Core conditions), equilibrium Xenon. All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.1 were recorded for a period of 5 minutes, which is sufficient time for RCS pressure to stabilize.

Those graphs were compared with graphs taken from a plant scram from 100% power on Aug. 26, 1987. The plant scram had been caused by APRM's during a surveillance. After carefully reviewing the graphs, all acceptance criteria for each of the monitored parameters from Appendix B.1.2.1 were verified and no deficiencies were identified.

TRANSIENT #2 - Loss of All Feedwater

As required by ANSI/ANS 3.5 (1985) Appendix B, a simultaneous trip of all Feedwater pumps was performed from 100% power, steady state (Middle of Life Core conditions), equilibrium Xenon.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.1 were recorded for a period of 10 minutes, which is sufficient time for transient conditions to stabilize.

Baseline data for comparison was taken from Updated Final Safety Analysis Report (UFSAR) - Loss of Feedwater, Closure of Feedwater Valves (Section 15.3.6). Graphical comparisons were made for each of the monitored parameters from Appendix B.1.2.1.

By use of the Best Estimate Evaluation Tabletop approach we determined that all acceptance criteria were met and no deficiencies were identified.

TRANSIENT #3 - MSIV Closure

As required by ANSI/ANS 3.5 (1985) Appendix B, a closure of all MSIV was performed from 100% power, steady state (Middle of Life Core Conditions), equilibrium Xenon.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.1 were recorded for a period of 5 minutes, which is sufficient time for transient conditions to stabilize.

Baseline data for comparison is from Startup Test #12 performed on January 1, 1971. Graphical comparisons were made for each of the monitored parameters from Appendix B.1.2.1. After careful analysis of the results, no deficiencies were identified.

TRANSIENT #4 - Trip of Both Recirc Pumps

As required by ANSI/ANS 3.5 (1985) Appendix B a trip of Both Recirc Pumps was performed from 100% power, steady state (Middle of Life Conditions), equilibrium Xenon.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.2 were recorded for 5 minutes, which is sufficient time for transient conditions to stabilize.

Baseline data for comparison was taken from UFSAR Analysis - Trip of Both Recirc Pumps (Figure 15.4-3 & 4) and startup Test #14. Graphical comparisons were made for each of the monitored parameters from Appendix B.1.2.2.

By use of the Best Estimate Evaluation Tabletop approach we determined that all acceptance criteria were met and no deficiencies were identified.

TRANSIENT #5 - Trip of One Recirc Pump

As required by ANSI/ANS 3.5 (1985) Appendix B a Trip of One Recirc Pump was performed from 100% power, steady state (Middle of Life Conditions), equilibrium Xenon.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.2 were recorded for 5 minutes, which is sufficient time for transient conditions to stabilize.

Baseline data for comparison was taken from UFSAR Analysis - Trip of One Recirc Pump (Figure 15.4-1 & 2) and Startup Test #14. Graphical comparisons were made for each of the monitored parameters from Appendix B.1.2.2.

Reactor water level response was slightly exaggerated for the plant conditions i.e., slightly more overshoot than desired. This item does not significantly affect training, and is being tracked under DR# 89-1-0205, to be resolved by 06/30/92.

By use of the Best Estimate Evaluation Tabletop approach we determined no other deficiencies.

TRANSIENT #6 - Turbine Trip

As required by ANSI/ANS 3.5 (1985) Appendix B a Turbine Trip was performed from 44% power, steady state (Middle of Life Conditions), equilibrium Xenon. A turbine trip from below 45% power will not result in a reactor scram.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.1 were recorded for a period of 1 minute.

Baseline data for comparison was taken from Transient Analysis - Turbine Trip (Figure 11.3.1.-1,2,3 & 4). Graphical comparisons were made for each of the monitored parameters from Appendix B.1.2.1. After carefully reviewing the results, no deficiencies were identified.

TRANSIENT #7 - Maximum Rate Power Ramp

As required by ANSI/ANS 3.5 (1985) Appendix B, a power ramp was performed from 100% power down to 75% power and then back to 100% power.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.1 were recorded for a period of 5 minutes, which is sufficient time to observe ramp response.

The reference plant data used for comparison was obtained from start up test transients #80, 172 and 179.

After reviewing the graphs, all acceptance criteria for each of the monitored parameters of Appendix B.1.2.1 were verified. The reactor water level response in the simulator was more pronounced than in the reference plant. This item is being addressed under DR# 89-1-0205, to be resolved by 06/30/92.

TRANSIENT #8 - MCA

As required by ANSI/ANS 3.5 (1985) Appendix B an MCA was performed from 100% power, steady state (Middle of Life conditions), equilibrium Xenon.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.3 were recorded for 10 minutes, which is sufficient time for transient conditions to stabilize.

Baseline data for comparison was taken from UFSAR Analysis - Design Break Response (Section 6.2). Graphical comparisons were made for each of the monitored parameters from Appendix B.1.2.3.

By use of the Best Estimate Evaluation Tabletop approach we determined that all acceptance criteria were met and no deficiencies were identified.

TRANSIENT #9 - Main Steam Line Break

As required by ANSI/ANS 3.5 (1985) Appendix B, a Main Steam Line Break was performed from 100% power, steady state (Middle of Life conditions), equilibrium Xenon.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.3 were recorded for 10 minutes, which is sufficient time for transient conditions to stabilize.

Baseline data for comparison was taken from General Electric Proprietary Information - Main Steam Line Break (Figure D83-87). Graphical comparisons were made for monitored parameters from Appendix B.1.2.3. All acceptance criteria for each parameter was verified, no deficiencies were identified.

TRANSIENT #10 - Isolation, Stuck SRV, Feedwater Failure

As required by ANSI/ANS 3.5 (1985) Appendix B, an Isolation, Stuck SRV, Feedwater Failure was performed from 100% power, steady state (Middle of Life conditions), equilibrium Xenon.

All parameters listed in ANSI/ANS 3.5 (1985) Appendix B.1.2.3 were recorded for 5 minutes, which is sufficient time for transient conditions to stabilize.

Baseline data for comparison was taken from General Electric Proprietary Information - Isolation, Stuck SRV, Feedwater Failure (Figure D2-D26), and best estimate analysis. Graphical comparisons were made for monitored parameters from Appendix B.1.2.3.

All acceptance criteria for each monitored parameter was verified, no deficiencies were identified.

ATTACHMENT 11

PHYSICAL FIDELITY SUMMARY REPORT

Form 7.5

SIMULATOR PHYSICAL FIDELITY/HUMAN FACTORS REPORT

UNIT: 1

REVISION: 0

Approved By: [signature] SOT Date: 5/11/90

Concurrence: Jeffrey Colandella for B.N. Roth MOT Date: 5/11/90

Concurrence: [signature] Unit Superintendent Date: 5/11/90

SCCC Mtg. No. 90-004

EXCEPTIONS - CONTROL ROOM LAYOUT

UNIT: MP1

1. The emergency plan communicatons 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 instuctor booth, there is no significant training impact, whether they communicate via the phone console at the Simulator Operator Desk or the real EOF and NRC phones in the reference plant control room. The simulator is not used to provide training on the radiopager. Use of the radiopager is not a licensed operator task. Large scale exercises on the emergency plan are not performed on the simulator, therefore the lack of identical radiopager, TSC, OSC, Berlin, Waterford Police, NRC and EOF phones do not present a problem.

2. The Shift Supervisor's (SS) office is not simulated. There is no training value and therefore no training impact to having an SS office in the simulator room.

3. The simulator and reference plant have different chairs. This has no training impact.

4. The P&ID Table the P&ID Cabinet and the Operating Procedures File Cabinets are in slightly different locations on the simulator versus the reference plant. All P&ID's present in the Reference Plant Control Room are present in the Simulator. All operating procedures present in the Reference Plant Control Room are present in the simulator. The difference in location of these P&ID's and procedures has no training impact.

Form 7.1 cont.

5. SCO desk is a permanent fixture in the reference plant while in the simulator it is a moveable desk. This causes no significant training impact.

6. No security monitor is installed in the simulator. This monitor in the reference plant is used to monitor conditions in the main security building and is not used in licensed operator training. Therefore no training impact.

7. In the reference plant a fuel assembly location map board is located in the main control room, north wall. This board has no training value in the simulator and is used primarily during refueling operations. Training value is insignificant.

8. Control Room panels 918, 919, 927, 928, 932, 933, 934, 946 (all back panels) are not modeled in the simulator. The panels would house items such as integrators, flow converters, alarm units, turbine supervisory instruments, and test switches. They have no annunciator panels, and are not required by any lesson plans for training. The absence of these panels causes no significant training impact.

9. There is no temperature/barometer measuring device in the simulator. This instrument is located on the end of panel 903 in the reference plant. Training value is insignifcant.

10. The updated RFL panel (CRP 909) in the reference plant has not been installed on the simulator. The original GETAC panel which the RFL panel replaced is modeled. The GETAC panel functions are similar to the upgraded RFL panel, but switches and indications are in different locations, and some readouts are different. Since training is conducted on the RFL in other training environments, its inclusion on the simulator was deemed to have little training value. However, based on feedback from the operators, the issue is being re-evaluated under the original deficiency (87-1-0037).

Completed by: [signature] Date: 5/8/90

Reviewed by: M.C. Jensen ASOT Date: 5/9/90

Form 7.2

EXCEPTIONS - PANEL LAYOUT

UNIT: MP1

1. Relaying test switches, transmission line protective audio tone units, and main generator and transformer relays on panel 922 A&B are not present in the simulator. The simulator is able to function properly without these components installed, but from a hardware fidelity standpoint the panels are incomplete. This presents no adverse effects on training.

2. Jet pump measuring (test) devices are not present on panel 938 in the simulator. This presents no significant effect to student training, since operations does not perform calibrations on those items.

3. Calibration plugs on multipoint recorders, on various panels are not present in the simulator. This presents no negative training effect to the students.

4. Met Tower information (panel 945) is still present in the simulator. A simulator design change, when completed, will remove recorders not present in the reference plant. No significant effect on training, since the operators use the Met Tower data that can be accesssed via the PPC.

5. Protection relays found on CRP 916 and CRP 917 in the reference plant are not dynamically modeled on the simulator. The relays, however are modeled and labeled using metal plates instead of working relays. Working relays were deemed to have little training value during the design and procurement of the simulator. Based on feedback from both the operators and trainers, dynamically modeling all or some of these relays is being re-evaluated under deficiency (88-1-0016) as a simulator enhancement.

Completed by: [signature] Date: 5/8/90

Reviewed by: M. C. [signature] ASOT Date: 5/9/90

Form 7.3

EXCEPTIONS - COMPONENTS

UNIT: 1

1. Operator aids found on the control panels of the reference plant have plastic or plexiglass covers installed. Operator aids in the simulator are identical to those in the plant, but are either unprotected, or have a plastic film covering. This difference has no impact on operator training.

2. In the simulator, the RRMG speed control interlock bypass toggle switches are located on CRP 923. The reference plant location is on an adjacent panel, which is not modeled in the simulator. These switches are protected beneath a plastic cover, (as in the plant), so that inadvertent operation is prevented. The switch location presents no significant effect on operator training.

3. Calibration stickers on instruments found in the reference plant may vary somewhat from those found in the simulator. Since these stickers are constantly being changed in the plant, perfect fidelity would be virtually impossible. Simulator stickers are reasonably close to those in the plant. This item causes no significant degradation of operator training.

4. Multipoint chart recorders in the reference plant have calibration input plugs (2 prong) located on the control board, below the recorder. The simulator does not have these items. Recorder calibrations are not a part of operator training; the lack of calibration sockets has no impact on operator training.

5. Minor misspellings on tags in the reference plant (such as condensor for condenser) were not always carried over into the simulator. This has absolutely no impact on training.

6. The B feed reg valve actual position indicator scale does not have "ACTUAL POSITION" printed on it, as in the reference plant. The A and C scales have this lettering, with each letter 1/16" high. Due to the small size of the letters, and since the surrounding indicators have the required printing, this item has virtually no impact on training.

Form 7.3 cont.

7. On CRP-923 (back panel) in the reference plant there is an unused chart recorder located above the intercept valve position indicators. This recorder was installed in the plant under PDCR 85-1-022, (Turb BPV Thermocouples), which remains open. If the PDCR is completed, this item will be modeled in the simulator. Presently there is no effect on operator training from this item.

8. The Flux Tilt Monitor, on CRP 910 was replaced in the reference plant with a Log Rad Monitor. This was intended to be a temporary installation, and a PDCR has not been received for the simulator. This instrument is not used in any training scenarios since it is not currently covered by a plant procedure; it presently has no effect on training.

9. Annunciator windows were carefully compared between the reference plant and the simulator. In addition to the items provided for in the Minor Differences Guideline (NSEM 4.12, Attachment 8.1), the following annunciator differences were deemed to have no impact on operator training:

   - Punctuation marks, if the understanding of annunciator is unchanged.
   - Minor misspellings that do not change word meaning (condensor instead of condenser).
   - Quotation marks that, if missing, do not change annunciator meaning or interpretation.

10. Leeds and Northrup recorders found on CRP 924 in the reference plant were out of production when the simulator was constructed. In the simulator, Esterline Angus recorders were used, which are similar to the L&N models. This item has no effect on training.

11. Megawatt and frequency recorders for measuring plant output are not the same as those in the reference plant, panel 931. No adverse training will result from this difference.

Completed by: J. E. Ryan Date: 5/8/90

Reviewed by: M. C. Hansen Date: 5/9/90
ASOT

Form 7.4

EXCEPTIONS - AMBIENT ENVIRONMENT

UNIT: 1

1. An illumination level measurement was performed in the reference plant control room and in the simulator per NSEM 6.3.1. Twenty-seven locations were measured and compared in each facility. Data was taken during normal lighting conditions and with only emergency lighting. The simulator lighting was found to be consistently brighter than the control room.

   Flourescent light strings energized in the simulator were switched, to provide lower illumination levels (still measured slightly brighter than the plant). Operators were satisfied with the resulting illumination levels. This item has no training impact.

2. Reference plant audible alarm sounds were compared with the simulator alarms per NSEM 6.3.2. The simulator alarms have been adjusted to replicate the plant to the maximum extent possible. This has proven satisfactory to the operators. No training impact results.

3. In the reference plant, there is a steady background noise from the Control Room ventilation fan, which is not present in the simulator. Deliberate and non-deliberate changes in this fans operation in the plant may provide aural cues to the operator. The lack of fan noise cues provides no significant impact on training.

4. There is no radiopager, nor are there phones for EOF, TSC, OSC, NRC, Waterford Police and Berlin in the simulator. Therefore the noise generated from their use is absent in the simulator. This item is discussed on Form 7.1, Number 1. No significant training impact results.

Completed by: John G. Ryan Date: 5/8/90

Reviewed by: M.C. Jensen ASOT Date: 5/9/90

Rev.: 1
Date: 12/20/89

ATTACHMENT 12

SAMPLE MALFUNCTION TEST PROCEDURES

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: SERVICE WATER
TEST TYPE: MAJOR MALFUNCTION
TEST TITLE: SW01 - LOSS OF SW

DATE: January 11, 1990
PAGE: 1
REV: 0
NE: SW

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR

CERTIFICATION SYSTEM TEST

UNIT:	MILLSTONE UNIT 1	DATE:	January 11, 1990
SYSTEM TITLE:	SERVICE WATER	PAGE:	1
TEST TYPE:	MAJOR MALFUNCTION	REV:	0
TEST TITLE:	SW01 - LOSS OF SW	NE:	SW

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR

#524300, SW01 - SW PUMP TRIP
SERVICE WATER PUMPS TRIP DUE TO OVERLOAD

CRITICAL PARAMETERS	RECORD METHOD	DURATION	INTERVAL
GEN. H2 PRESS. EPR-11	RP	20 MIN	2 SEC
TURB. L.O. TEMP TI-2-70	RP	20 MIN	2 SEC
RWCU NRHX OUTLET TEMP TI-1290-?1A	RP	20 MIN	2 SEC
RBEDT TIS-6-2-B	RP	20 MIN	2 SEC
D/W BULK TEMP TI-1602-B-R-C	RP	20 MIN	2 SEC
RX WATER LEVEL 263-100B-B	RP	20 MIN	2 SEC
STATOR CLG. TEMPS. TR-931-1	MPR	20 MIN	36 SEC
GEN. LEADS TEMPS. TR-931-3	MPR	20 MIN	68 SEC
ALT. AIR TEMP. TR-931-2	MPR	20 MIN	44 SEC
RR PUMP MOTOR TEMPS	MPR	20 MIN	64 SEC

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: SERVICE WATER
TEST TYPE: MAJOR MALFUNCTION
TEST TITLE: SW01 - LOSS OF SW

DATE: January 11, 1990
PAGE: 1
REV: 0
NE: SW

STEP	PROCEDURE/RESULT		PANEL	TAG #	INIT/DR
	TR-262-14				
	COND. PUMP BRG. TEMPS TR-2-56	MPR	20 MIN	90 SEC	
	COND. BOOSTER PUMP BRG TEMPS TR-2-56	MPR	20 MIN	90 SEC	
	RFP BRG TEMPS TR-2-49	MPR	20 MIN	80 SEC	

PPC POINTS TO BE VERIFIED: NONE

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
524301	RESET TO IC-13	-PCM-	IC-13	
	100% REACTOR POWER, EQUILIBRIUM XENON, MOL.			
524302	INSERT MALFUNCTION SW01A,B,C,D	-PCM-	MF-SW01A,B,C,D	
	AMMETERS SPIKE	906	EI-11A	
	SERVICE WATER PUMPS A,B,C,D TRIP			
	SERVICE WATER PUMPS A,B,C,D OVERLOAD OR TRIP (ACTUATES) ON RUNNING PUMPS	-ANN-	906A2(7-1) 906A2(7-2) 906A2(7-3) 906A2(7-4)	
	S.W. PUMPS DISCH PRESS LOW	ANN	906A2(7-5)	
	COOLING WATER FLOW IS REDUCED TO THE FOLLOWING			

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: SERVICE WATER
TEST TYPE: MAJOR MALFUNCTION
TEST TITLE: SW01 - LOSS OF SW

DATE: January 11, 1990
PAGE: 1
REV: 0
NE: SW

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DR
	LOADS: RBCCW HEAT EXCHANGERS TBCCW HEAT EXCHANGERS TBSCCW HEAT EXCHANGERS DIESEL GENERATOR			
524303	REVIEW ALL CONTROL ROOM PANELS AND SELECT DATA POINTS AS NECESSARY TO ENSURE COMPONENTS WHICH HAVE LOST COOLING ARE INCREASING. POINTS INCLUDE CRITICAL PARAMETERS LISTED.			

* * * END TEST 524300 * * *

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: AUTOMATIC PRESSURE RELIEF
TEST INDEX NUMBER : MALFUNCTION
TEST TITLE: AP01 - APR/SRV SETPOINT INCORRECT

DATE: May 4, 1990
PAGE: 1
REV: 04
NE: AP

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1 DATE: May 4, 1990
SYSTEM TITLE: AUTOMATIC PRESSURE RELIEF PAGE: 1
TEST INDEX NUMBER : MALFUNCTION REV: 04
TEST TITLE: AP01 - APR/SRV SETPOINT INCORRECT NE: AP

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DI
500300,AP01 - APR/SRV SETPOINT INCORRECT (100% = TWO TIMES NORMAL SETPOINT)				
500301	RESET TO IC-13	-PCM-	IC-13	
	100% POWER, EQUILIBRIUM XENON, MOL.			
500302	ACTIVATE MALFUNCTION AT 100%.	-PCM-	MF-AP01A	
	NOTHING HAPPENS			
500303	REDUCE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3A LIFTS.	-PCM-	MF-AP01A	
	VALVE LIFTS WHEN 1095 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS LESS THAN REACTOR PRESSURE.			
	SAFETY & BLOWDOWN VALVE LEAKAGE (ACTUATES) WHEN RECORDER REACHES 260 DEGREES F.	-ANN-	903A1(6-2)	
	SAFETY/RELIEF VALVE OPEN (ACTUATES)	-ANN-	903A3(4-8)	
500304	ALLOW THE PRESSURE TRANSIENT TO STABILIZE.			
500305	INCREASE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3A SEATS.	-PCM-	MF-AP01A	
	VALVE SEATS WHEN 1018 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS GREATER THAN REACTOR PRESSURE.			

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: AUTOMATIC PRESSURE RELIEF
TEST INDEX NUMBER : MALFUNCTION
TEST TITLE: AP01 - APR/SRV SETPOINT INCORRECT

DATE: May 4, 1990
PAGE: 2
REV: 04
NE: AP

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DF
	SAFETY/RELIEF VALVE OPEN (CLEARS)	-ANN-	903A3(4-8)	
500306	RESET TO IC-13	-PCM-	IC-13	
	100% POWER, EQUILIBRIUM XENON, MOL.			
500307	ACTIVATE MALFUNCTION AT 100%.	-PCM-	MF-AP01B	
	NOTHING HAPPENS			
500308	REDUCE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3B LIFTS.	-PCM-	MF-AP01B	
	VALVE LIFTS WHEN 1125 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS LESS THAN REACTOR PRESSURE.			
	SAFETY & BLOWDOWN VALVE LEAKAGE (ACTUATES) WHEN RECORDER IS AT 260 DEGREES.	-ANN-	903A1(6-2)	
	SAFETY/RELIEF VALVE OPEN (ACTUATES)	-ANN-	903A3(4-8)	
500309	INCREASE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3B SEATS.	-PCM-	MF-AP01B	
	VALVE SEATS WHEN 1001 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS GREATER THAN REACTOR PRESSURE.			
	SAFETY/RELIEF VALVE OPEN (CLEARS)	-ANN-	903A3(4-8)	
500310	RESET TO IC-13	-PCM-	IC-13	
	100% POWER, EQUILIBRIUM XENON, MOL.			

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: AUTOMATIC PRESSURE RELIEF
TEST INDEX NUMBER : MALFUNCTION
TEST TITLE: AP01 - APR/SRV SETPOINT INCORRECT

DATE: May 4, 1990
PAGE: 3
REV: 04
NE: AP

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
500311	ACTIVATE MALFUNCTION AT 100%.	-PCM-	MF-AP01C	
	NOTHING HAPPENS.			
500312	REDUCE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3C LIFTS.	-PCM-	MF-AP01C	
	VALVE LIFTS WHEN 1125 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS LESS THAN REACTOR PRESSURE.			
	SAFETY & BLOWDOWN VALVE LEAKAGE (ACTUATES)	-ANN-	903A1(6-2)	
	SAFETY/RELIEF VALVE OPEN (ACTUATES)	-ANN-	903A3(4-8)	
500313	ALLOW THE PRESSURE TRANSIENT TO STABILIZE.			
500314	INCREASE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3C SEATS.	-PCM-	MF-AP01C	
	VALVE SEATS WHEN 1035 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS GREATER THAN REACTOR PRESSURE.			
	SAFETY/RELIEF VALVE OPEN (CLEARS)	-ANN-	903A3(4-8)	
500315	RESET TO IC-13	-PCM-	IC-13	
	100% POWER, EQUILIBRIUM XENON, MOL.			
500316	ACTIVATE MALFUNCTION AT 100%.	-PCM-	MF-AP01D	
	NOTHING HAPPENS			

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: AUTOMATIC PRESSURE RELIEF
TEST INDEX NUMBER : MALFUNCTION
TEST TITLE: AP01 - APR/SRV SETPOINT INCORRECT

DATE: May 4, 1990
PAGE: 4
REV: 04
NE: AP

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/DI
500317	REDUCE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3D LIFTS.	-PCM-	MF-AP01D	
	VALVE LIFTS WHEN 1110 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS LESS THAN REACTOR PRESSURE.			
	SAFETY & BLOWDOWN VALVE LEAKAGE (ACTUATES)	-ANN-	903A1(6-2)	
	SAFETY/RELIEF VALVE OPEN (ACTUATES)	-ANN-	903A3(4-8)	
500318	INCREASE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3D SEATS.	-PCM-	MF-AP01D	
	VALVE SEATS WHEN 1032 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS GREATER THAN REACTOR PRESSURE.			
	SAFETY/RELIEF VALVE OPEN (CLEARS)	-ANN-	903A3(4-8)	
500319	RESET TO IC-13	-PCM-	IC-13	
	100% POWER, EQUILIBRIUM XENON, MOL.			
500320	ACTIVATE MALFUNCTION AT 100%.	-PCM-	MF-AP01E	
	NOTHING HAPPENS			
500321	REDUCE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3E LIFTS.	-PCM-	MF-AP01E	
	VALVE LIFTS WHEN 1125 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS LESS THAN REACTOR PRESSURE.			

CERTIFICATION SYSTEM TEST

UNIT: MILLSTONE UNIT 1
SYSTEM TITLE: AUTOMATIC PRESSURE RELIEF
TEST INDEX NUMBER : MALFUNCTION
TEST TITLE: AP01 - APR/SRV SETPOINT INCORRECT

DATE: May 4, 1990
PAGE: 5
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NE: AP

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
	SAFETY & BLOWDOWN VALVE LEAKAGE (ACTUATES)	-ANN-	903A1(6-2)	
	SAFETY/RELIEF VALVE OPEN (ACTUATES)	-ANN-	903A3(4-8)	
500322	ALLOW THE PRESSURE TRANSIENT TO STABILIZE.			
500323	INCREASE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3E SEATS.	-PCM-	MF-AP01E	
	VALVE SEATS WHEN 1012 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS GREATER THAN REACTOR PRESSURE.			
	SAFETY/RELIEF VALVE OPEN (CLEARS)	-ANN-	903A3(4-8)	
500324	RESET TO IC-13	-PCM-	IC-13	
	100% POWER, EQUILIBRIUM XENON, MOL.			
500325	ACTIVATE MALFUNCTION AT 100%.	-PCM-	MF-AP01F	
	NOTHING HAPPENS			
500326	REDUCE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3F LIFTS.	-PCM-	MF-AP01F	
	VALVE LIFTS WHEN 1125 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS LESS THAN REACTOR PRESSURE.			
	SAFETY & BLOWDOWN VALVE LEAKAGE (ACTUATES)	-ANN-	903A1(6-2)	
	SAFETY/RELIEF VALVE OPEN (ACTUATES)	-ANN-	903A3(4-8)	

CERTIFICATION SYSTEM TEST

STEP	PROCEDURE/RESULT	PANEL	TAG #	INIT/D
500327	INCREASE MALFUNCTION SEVERITY UNTIL SRV 1-MS-3F SEATS.	-PCM-	MF-AP01F	
	VALVE SEATS WHEN 1023 PSIG TIMES MALFUNCTION SEVERITY DIVIDED BY 50 IS GREATER THAN REACTOR PRESSURE.			
	SAFETY/RELIEF VALVE OPEN (CLEARS)	-ANN-	903A3(4-8)	

* * * END OF TEST 500300 * * *

ATTACHMENT 13

LIST OF CERTIFIED REMOTE FUNCTIONS

Figure 7.1

CERTIFIED REMOTE FUNCTIONS LIST

UNIT MP1 PAGE 1 OF 12

CCR01	TBCCW HX A Isolation Valves 1-CC-4A & 5A
CCR02	TBCCW HX B Isolation Valves 1-CC-4B & 5B
CCR03	TBCCW HX C Isolation Valves 1-CC-4C & 5C
CCR04	TBCCW Surge Tank Make-Up Valve 1-DW-9
CCR08	TBCCW Pump Dischg Valve 1-CC-3A
CCR09	TBCCW Pump Dischg Valve 1-CC-3B
CCR10	TBCCW Pump Dischg Valve 1-CC-3C
CCR11	Generator Hydrogen Pressure Reg PSIG
CCR12	Generator Leads Fan Motor A
CCR15	Turb L.O. Temperature Controller
CCR16	TBCCW Surge Tank Drain Valve
CCR17	Generator Casing Hydrogen Vent Vlv
CCR18	Generator Leads Cooler Outlet Valve
CCR19	RR MG Oil Cooler Throttle Valve V4-40A
CCR20	RR MG Oil Cooler Throttle Valve V4-40B
CCR21	Reset Stator and Hydrogen Trouble Alarm
CCR22	Generator Hydrogen Purity
CHR01	Drywell Cooling Unit HVH-18
CHR02	Drywell Cooling Unit HVH-19
CHR03	Drywell Cooling Unit HVH-20
CHR04	Drywell Cooling Unit HVH-21
CHR05	Drywell Cooling Unit HVH-22
CHR06	Drywell Cooling Unit HVH-26
CHR07	Drywell Cooling Unit HVH-27
CHR08	Drywell Cooling Unit HVH-28
CHR10	Drywell Compressor A

M. C. Jensen 7/12/89
ASOT Signature/Date

Rev.: 0
Date: 5/04/88
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Figure 7.1

CERTIFIED REMOTE FUNCTIONS LIST

UNIT MP1 PAGE 2 OF 12

CHR11	Drywell Compressor B
CHR12	HVA Trouble Alarm
CHR14	D.W. 02 Monitor
CHR16	Drywell Fan Trip Override
CSR03	CS Pump Suction from CST Valve 1-MW-91A
CSR04	CS Pump Suction from CST Valve 1-MW-91B
CUR03	CU Filter Bypass Vlv 1-CU-14
CUR04	CU Demin A Eff Vlv 1-CU-17A
CUR05	CU Demin B Eff Vlv 1-CU-17B
CUR06	CU Demin C Eff Vlv 1-CU-17C
CUR07	CU Demin Bypass Vlv 1-CU-15
CUR10	Rx Water Conductivity Sample Point
CWR01	Vacuum Priming Pump
EDR01	Main Transformer Disconnect 15G-1X1-4
EDR02	14D/14G Tie Breaker Rackout
EDR04	Battery Charger A Output Breaker
EDR05	Battery Charger B Output Breaker
EDR06	Spare Battery Charger Output Breakers
EDR07	101-AB-1 ABT Normal Power
EDR08	101-AB-2 ABT Normal Power
EDR09	101-AB-3 ABT Normal Power
EDR10	LNP Logic Power
EDR11	Panel DC-11A-1 Power Supply
EDR12	Panel DC-11A-2 Power Supply
EDR13	14A/14G Tie Breaker
EDR14	14C/14G Tie Breaker

M.C. Jensen 7/12/89

CASOT Signature/Date

Figure 7.1

CERTIFIED REMOTE FUNCTIONS LIST

UNIT MP1 PAGE 3 OF 12

EDR16	12E/12F Tie Breaker Rackout
EDR17	Master Overcurrent Trip Reset
EDR18	MCC Group A DC Control Power
EDR19	MCC Group B DC Control Power
EDR20	Power Supply to MCC EF7
EDR21	LNP Tripped Breakers Reset
EDR22	Jumper Lockout Relay 3 and 4
EDR23	Alternate Power Source for CRD Pumps
EDR24	Alternate Power Source for SD Pumps
EDR25	21S3-1-2 Brkr Local Control
EDR26	21S3-2-2 Brkr Local Control
EDR27	Oscillograph Trouble Alarm Reset
EGR01	Diesel Generator Lockout Relay
EGR02	Gas Turbine Generator Lockout Relay
EGR03	Diesel Generator Supply to Bus 14E
EGR04	Gas Turbine Black Start Switch
EGR06	Diesel Generator Trouble Alarm
EGR07	Gas Turbine Trouble Alarm
EGR08	Generator Core Moniotr
EXR02	Wind Speed
EXR04	Wind Direction
EXR08	L.I. Sound Water Temperature
EXR10	Line 348 Real Load (Swing)
EXR11	Line 383 Base Real Load
EXR12	Line 371 Base Real Load
EXR13	Line 310 Base Real Load

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Figure 7.1

CERTIFIED REMOTE FUNCTIONS LIST

UNIT MP1 PAGE 4 OF 12

EXR18	Line 348 Distribution Factor
EXR19	Line 383 Distribution Factor
EXR20	Line 371 Distribution Factor
EXR21	Line 310 Distribution Factor
EXR28	Grid Voltage (Normal 359)
EXR30	Unit 3 RSST Disconects
EXR31	Unit 3 Main Generator Disconnects
EXR32	Unit 3 15G-13T-2
EXR33	Unit 3 15G-14T-2
FWR01	Operate FW Cntl Valve 1-FW-5A (FWR44)
FWR02	Operate FW Cntl Valve 1-FW-5B (FWR45)
FWR04	Operate Emerg Cond Xfer PP Disch Vlv (+)
FWR09	Condensate PP A Disch Valve 1-CN-3A
FWR10	Override 1-CN-3A Limit Switch Contacts
FWR11	Condensate PP B Disch Valve 1-CN-3B
FWR12	Override 1-CN-3B Limit Switch Contacts
FWR13	Conds PP C Disch Valve 1-CN-3C
FWR14	Override 1-CN-3C Limit Switch Contacts
FWR15	Conds Demin A Eff Valve 1-CD-51A
FWR16	Conds Demin B Eff Valve 1-CD051B
FWR17	Conds Demin C Eff Valve 1-CD-51C
FWR18	Conds Demin D Eff Valve 1-CD-51D
FWR19	Conds Demin E Eff Valve 1-CD-51E
FWR20	Conds Demin F Eff Valve 1-CD-51F
FWR21	Conds Demin G Eff Valve 1-CD-51G
FWR22	Conds Demin Bypass Valve 1-CN-28

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Figure 7.1

CERTIFIED REMOTE FUNCTIONS LIST

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FWR23	Water to RBCCW/TBCCW/SCCW Valve 1-DW-70
FWR24	Hotwell "A" Conductivity Recorder Scale
FWR25	Hotwell "B" Conductivity Recorder Scal
FWR26	Hotwell "C" Conductivity Recorder Scale
FWR27	Hotwell "D" Conductivity Recorder Scale
FWR29	Makeup to Demin Water Storage Tank
FWR30	Demin Water to CST Valve 1-DW-6
FWR31	CRD Suct From CST
FWR32	FWCI Cond Xfer Suction from CST 1-MW-90
FWR33	FWCI Cond Xfer Suction from ESW V7-140
FWR36	Cond. Booster Pump "A"
FWR37	Cond. Booster Pump "B"
FWR38	Cond. Booster Pump "C"
FWR39	Condensate Transfer Pump Suction Source
FWR40	Vent Condensate Header
FWR41	Vent Feedwater Header
FWR42	Condensate Demin Trouble Alarm
FWR43	CRD Suct from Reject Line
FWR44	Manually Position 1-FW-5A
FWR45	Manually Position 1-FW-5B
IAR01	Air from Unit 2 Crossconnect Valve
IAR02	Containment Inst. Air Header Suply
IAR03	SA/IA Crossconnect Valve 1-IA-16
IAR04	Instrument Air Valve IA-21
LPR01	Operate LPCI HX A Bypass 1-LP-7A (+)
LPR02	Operate LPCI HX B Bypass 1-LP-7B (+)

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LPR03	Operate LPCI A Torus Spray 1-LP-13A (+)
LPR04	Operate LPCI B Torus Spray 1-LP-13B (+)
LPR05	Operate LPCI A Injection 1-LP-10A (+)
LPR06	Operate LPCI B Injection 1-LP-10B (+)
LPR07	Align LPCI Pump A Suction to CST
LPR08	Align LPCI Pump B Suction to CST
LPR09	Align LPCI Pump C Suction to CST
LPR10	Align LPCI Pump D Suction to CST
LPR13	Operate LPCI A Torus Spray 1-LP-14A (+)
LPR14	Operate LPCI B Torus Spray 1-LP-14B (+)
LPR15	Operate LPCI A Injection 1-LP-9A (+)
LPR16	Operate LPCI B Injection 1-LP-9B (+)
LPR17	LPCI Discharge to Radwaste 1-LP-50A/B
LPR18	Fire Water Supply to HX-M8-76A
MSR07	HP FW Htr 5A Extr STM Stop 1-ES-2A
MSR08	HP FW Htr 5B Extr STM Stop 1-ES-2B
MSR09	Auxiliary Seal Steam Supply Valve
MSR10	Bypass 263-57A
MSR11	Bypass 263-57B
MSR12	Bypass 263-58A
MSR13	Bypass 263-58B
MSR14	Group 1 108 Relay Reset
NIR01	APRM 1 Calibration Factor
NIR02	APRM 2 Calibration Factor
NIR03	APRM 3 Calibration Factor
NIR04	APRM 4 Calibration Factor

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Figure 7.1

CERTIFIED REMOTE FUNCTIONS LIST

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NIR05	APRM 5 Calibration Factor
NIR06	APRM 6 Calibration Factor
NIR11	IRM 11 Calibration Factor (Ranges 1-6)
NIR12	IRM 12 Calibration Factor
NIR13	IRM 13 Calibration Factor (Ranges 1-6)
NIR14	IRM 14 Calibration Factor (Ranges 1-6)
NIR15	IRM 15 Calibration Factor (Ranges 1-6)
NIR16	IRM 16 Calibration Factor (Ranges 1-6)
NIR17	IRM 17 Calibration Factor (Ranges 1-6)
NIR18	IRM 18 Calibration Factor (Ranges 1-6)
NIR21	SRM 21 Calibration Factor
NIR22	SRM 22 Calibration Factor
NIR23	SRM 23 Calibration Factor
NIR24	SRM 24 Calibration Factor
NIR25	Replace Tip Machine 3 Shear Valve
NIR31	IRM 11 Calibration Factor (Ranges 7-11)
NIR32	IRM 12 Calibration Factor (Ranges 7-11)
NIR33	IRM 13 Calibration Factor (Ranges 7-11)
NIR34	IRM 14 Calibration Factor (Ranges 7-11)
NIR35	IRM 15 Calibration Factor (Ranges 7-11)
NIR36	IRM 16 Calibration Factor (Ranges 7-11)
NIR37	IRM 17 Calibration Factor (Ranges 7-11)
NIR38	IRM 18 Calibration Factor (Ranges 7-11)
OGR01	Steam to Preheater Isol Valve 1-MS-106A
OGR02	Steam to Preheater Isol Valve 1-MS-106E
OGR05	Gas Cooler Bypass Valve V-7

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CERTIFIED REMOTE FUNCTIONS LIST

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OGR06	Gas Cooler Inlet Valve V-8
OGR07	Gas Cooler Outlet Valve V-9
OGR08	Defrost and Drain Gas Cooler
OGR09	Glycol Cooling Units
RCR01	Operate RBCCW Loop Isol Vlv 1-RC-15(+)
RCR02	RBCCW HX A Isol Vlvs 1-RC-4A & 5A
RCR03	RBCCW HX B Isol Vlvs 1-RC-4B & 5B
RCR04	RBCCW HX C Isol Vlvs 1-RC-4C & 5C
RCR06	RBCCW Pump Discharge Valve 1-RC-115A
RCR07	RBCCW Pump Discharge Valve 1-RC-115B
RCR09	RBCCW Surge Tank Drain Valve
RCR10	RWCU NRHX Cooling Outlet V4-70
RCR12	Fire Water Supply to RBCCW Header
RCR13	RBCCW Valve 1-RC-137
RDR01	CRD Pump A Disch. Valve 301-5A
RDR02	CRD Pump B Disch. Valve 301-5B
RDR03	CRD Pump A to Head Spray Valve
RDR04	CRD Pump B to Head Spray Valve
RDR06	Pump Test Bypass Valve
RDR07	Drive Water PCV Bypass
RDR08	Cooling Water PCV Bypass
RDR09	CRD Flow Control Valve Selection
RDR10	CRD Pump Combined Disch Valve 301-170
RDR11	CRD Pump A Suction Valve 1-MW-101A
RDR12	CRD Pump B Suction Valve 1-MW-101B
RDR13	Charging Hdr Isol Vlv 1-CRD-49 301-25

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CERTIFIED REMOTE FUNCTIONS LIST

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RMR01	Rad Waste Effluent Radiation CPS
RPR01	RPS Bus Alternate Feed From IRP-11
RPR07	IRP EPA Reset
RPR08	RP MG A EPA Reset/Restart
RPR09	RP MG B EPA Reset/Restart
RRR01	Recirc MG A Scoop Tube Position (+)
RRR02	Recirc MG B Scoop Tube Position (+)
RRR03	Recirc PP A Seal Supply Isolation
RRR04	Recirc PP B Seal Supply Isolation
RRR05	Recirc MG A Lockout
RRR06	Recirc MG B Lockout
RRR07	Recirc MG A DC Aux Lube Oil Pump C
RRR08	Recirc MG B DC Aux Lube Oil Pump D
SCR01	TBSCCW HX A Iso Vlvs 1-SC-4A and 1-SC-5A
SCR02	TBSCCW HX B Iso Vlvs 1-SC-4B and 1-SC-5B
SCR04	TBSCCW Surge Tank Make-Up Valve 1-DW-10
SCR05	TBSCCW Pump Discharge Valve 1-SC-3A
SCR06	TBSCCW Pump Discharge Valve 1-SC-3B
SCR07	TBSCCW Surge Tank Drain Valve
SDR01	Shutdown Cooling Inlet Valve 1-SD-1 (+)
SDR02	Isolation Condenser Supply Fire-47
SDR03	Iso Cond Shell Drain Valves 1-IC-17 & 18
SDR04	Iso Cond Supply From Cond Xfer 1-MW-60
SDR05	IC-3 Manual Operator
SDR06	Manually Position IC-3
SDR07	Manually Open 1-HS-4

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CERTIFIED REMOTE FUNCTIONS LIST

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SDR08	IC Valve 1-IC-5 Throttling
SLR01	SLC Pump Suction Source
SLR02	SLC Pump 1 Test Switch
SLR03	SLC Pump 2 Test Switch
SLR07	SLC Test Tank Fill Valve 1-DW-21
SWR01	SW Strainer Bypass Valve 1-SW-19
SWR02	RBCCW Cooling Water Supply
SWR03	RBCCW HX M4-9A Inlet Isolation Valve
SWR04	RBCCW HX M4-9B Inlet Isolation Valve
SWR05	RBCCW HX M4-9C Inlet Isolation Valve
SWR06	TBCCW HX M4-2A Isolation Valves
SWR07	TBCCW HX M4-2B Isolation Valves
SWR08	TBCCW HX M4-2C Isolation Valves
SWR09	[illegible]CW HX M4-14A Isolation Valves
SWR10	TBSCCW HX M4-14B Isolation Valves
SWR11	RBCCW HX Outlet Valve 1-SW-6A
SWR12	RBCCW HX Outlet Valve 1-SW-6B
SWR13	RBCCW HX Outlet Valve 1-SW-6C
SWR14	ESW/SW Crosstie Throttle Vlv 1-LPC-23
SWR15	1-SW-9 Supply Breaker
SWR16	Manually Operate 1-SW-9
SWR17	Manual Supply of Fire Water to SW HX
SWR18	Fire Water Supply to Diesel
TOR01	APRM CH 1 (15%, 120%, .58+62%, INOP)
TOR02	APRM CH 2 (15%, 120%, .58+62%, INOP)
TOR03	APRM CH 3 (15%, 120%, .58+62%, INOP)

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CERTIFIED REMOTE FUNCTIONS LIST

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TOR04	APRM CH 4 (15%, 120%, .58+62%, INOP)
TOR05	APRM CH 5 (15%, 120%, .58+62%, INOP)
TOR06	APRM CH 6 (15%, 120%, .58+62%, INOP)
TOR07	IRM CH 11-14 (120/125, INOP)
TOR08	IRM CH 15-18 (120/125, INOP)
TOR09	APRM DNSC With IRM Hi-Hi
TOR10	Manual Scram CH A
TOR11	Manual Scram CH B
TOR12	Reactor Low Water Level CH A
TOR13	Reactor Low Water Level CH B
TOR14	Reactor High Pressure
TOR15	Drywell High Pressure
TOR16	Condenser Low Vacuum CH A
TOR17	Condenser Low Vacuum CH B
TOR18	MSIV Closure
TOR19	Turbine Stop Valve Closure
TOR20	Turbine Control Valve Fast Closure
TOR21	Steam Line High Radiation
TOR22	Scram Air Header Low Pressure
TOR23	Scram Discharge Volume High Level
TOR24	Manual Turbine Trip
TOR25	Generator Lockout Turbine Trip
TOR26	RPV High Water Level Turbine Trip
TOR27	Thrust Bearing Wear Turbine Trip
TOR28	Condenser Vacuum Turbine Trip
TOR29	Exhaust Hood High Temp Turbine Trip

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CERTIFIED REMOTE FUNCTIONS LIST

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TOR30	Moist Sep High Level Turbine Trip
TOR31	Group I Isolation Override
TOR32	Group II Isolation Override
TOR33	Group III Isolation Override
TOR34	Group IV Isolation Override
TOR35	Group V Isolation Override
TUR01	Emergency Bearing Oil Pump Breaker
WDR01	Electric Fire Pump
WDR02	Diesel Fire Pump
WDR03	Reset Rad Waste Trouble Alarm
WDR05	All Sump Pump Breakers
ZRA	Spare
ZRA	Spare
ZRA	Spare

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ATTACHMENT 14

COMMONLY USED ABBREVIATIONS AND DEFINITIONS

SIMULATOR SYSTEM ABBREVIATIONS

AN	Annunciator
AP	Automatic Pressure Relief
CC	Turbine Building Closed Cooling Water
CH	Containment Heating and Ventilation
CR	Reactor Core
CS	Core Spray
CU	Reactor Water Cleanup
CW	Circulating Water
ED	Electrical Distribution
EG	Electrical Generation
FW	Feedwater
IA	Instrument Air
LP	Low Pressure Coolant Injection
MS	Main Steam
NI	Nuclear Instrumentation
OG	Off Gas
PC	Process Computer
RC	Reactor Building Closed Cooling Water
RD	Control Rod Drive, Rod Position Indication
RM	Radiation Monitoring
RP	Reactor Protection
RR	Reactor Recirculation
RW	Rod Worth Minimizer

SIMULATOR SYSTEM ABBREVIATIONS (cont)

SC	Secondary Closed Cooling Water
SD	Shutdown Cooling
SL	Standby Liquid Control
SW	Service Water
TC	Turbine Control
TU	Turbine
WD	Waste Disposal

COMMON ABBREVIATIONS

Abbreviation	Full Name
AI	Analog Input
AO	Analog Output
ANS 3.5	ANSI/ANS 3.5 (1985)
BOL	Beginning of Life
DG	Diesel Generator
DI	Digital Input
DO	Digital Output
DR	Deficiency Report
EOL	End of Life
EOP	Emergency Operating Procedure
FWCI	Feed Water Coolant Injection
IC	Initial Condition
LNP	Loss of Normal Power
MOL	Middle of Life
MSIV	Main Steam Isolation Valve
MWE	Megawatts Electric
NSEM	Nuclear Simulator Engineering Manual
PDCR	Plant Design Change Record
PPC	Plant Process Computer
PTL	Pull-To-Lock
RBCCW	Reactor Building Closed Cooling Water

COMMON ABBREVIATIONS (cont)

Abbreviation	Full Name
SCCC	Simulator Configuration Control Committee
SDC	Shutdown Cooling System OR Simulator Design Change
SIG	Simulator Instructor Guide
SOER	Significant Operating Event Report
SSD	Simulator System Diagram
SW	Service Water
TBCCW	Turbine Building Closed Cooling Water

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).

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 the 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 Simulator Technical Support Branch (STSB) 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 the procedures necessary for the development and implementation of the certification program. It is a controlled document and its purpose is to insure consistent application of the certification process.

Performance Test - A define 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.

Reference Plant Data Book (PDB) - A compilation of reference plant data for specific plant transients/evolutions. The data defines plant parameter 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 committee shall include as permanent members the Di ctor of NTD, the Managers of OTB and STS, Supervisor - SCE, Supe isor - HW Maintenance, and the four Unit Operations Consultar s.

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 Senior Reactor Operator (or certified), 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.

System Test - A test developed for each modeled plant system that ensures proper response of all control board instrumentation, controls, annunciators, PPC points, remote functions, flowpaths, and components that are associated with an individual plant system.

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

ATTACHMENT 15

QUALIFICATIONS OF PERSONNEL DEVELOPING
AND PERFORMING SIMULATOR CERIFICATION TESTING

This attachment lists the Nuclear Training Department personnel involved in developing and conducting Millstone 1 simulator Certification 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. Additional experienced NTD personnel were involved in the cerification effort, but to a lesser degree.

SIMULATOR TECHNICAL SUPPORT BRANCH

Lung-Rui Huang - Supervisor, Simulation Computer Engineering.

NU Experience:

- Five 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

Ali R. Karimi - Engineer/Unit Software Coordinator

NU Experience:

- Five years experience in real time simulation

Other Related Experience:

- Five years simulation experience with Link Simulation Systems Division of Singer Company

Education:

- M.S. in Electrcial Engineering, University of Missouri - Columbia

OPERATOR TRAINING BRANCH

Michael C. Jensen - Assistant Supervisor, Operator Training, Millstone 1

NU Experience:

- Seven years in Operator Training as the supervisor responsible for simulator performance and training

Other Related Experience:

- Four years at the University of Wisconsin Nuclear Engineering Department. Acting Reactor Supervisor of TRIGA Experimental Reactor.
- Six years U.S. Naval Nuclear Power Program

Education:

- B.S. in Nuclear Engineering

Licenses:

- Currently SRO licensed, MP1 (7 years)
- Previously SRO and RO licensed, U. of W. TRIGA Reactor
- Licensed Professional Engineer, Nuclear (Connecticut)

Christopher Tabone - Senior Operator Instructor Millstone 1

NU Experience:

- Seven years Commercial Nuclear Power
- Operations Instructor MP1 (7 years)

Other Related Experience:

- B.S. Marine Engineerng

NRC Licenses:

- Currently SRO Licensed MP1 (6 years)

James Moffatt - Operation's Consultant Millstone 1

NU Experience:

- Twenty-three years Commercial Nuclear Power
- Shift Supervisor MP1 (4 years)
- Shift Supervisor MP2 (3 years)

Other Related Experience:

- U.S. Navy (3 years)

NRC Licenses:

- BWR SRO License (1970)
- PWR SRO License (1975)

Micheal D. Schulz - Operator Instructor MP1

NU Experience:

- Eight years Commercial Nuclear Power
- Five years MP1 Operations
- Three years MP1 Training

Other related experience:

- Eight years U. S. Navy

NRC Licenses:

- Currently RO Licensed MP1 (3 years)
- SRO Certified MP1 (3 years)

John G. Rogers - Operator Instructor Millstone 1

NU Experience:

- Four years MP1 Training

Other Related Experience:

- Three years, Plant E.I. Hatch, Shift Supervisor
- Five years, U.S. Navy, Submarine Officer

Education:

- B.S., Naval Architecture, U.S. Naval Academy

Licenses:

- Currently SRO Licensed, MP1 (3 years)
- SRO Licensed Plant E.I. Hatch, Units 1 and 2 (2 years)
- Licensed Profesional Engineer, Mechanical (CT and GA)

VOLUME 4

MILLSTONE UNIT 1 SIMULATOR PERFORMANCE TEST REPORT

MALFUNCTION INDEX

SYSTEM	DESCRIPTION	SYSTEM FUNCTION KEY TO PRESS	PAGE NOS.
AN	ANNUNCIATOR	PC/AN	MF001
AP	AUTOMATIC PRESSURE RELIEF	MS/AP	MF002
CC	TURBINE BUILDING CLOSED COOLING WATER	CC/SC	MF003
CM	CONTAINMENT/HVAC	CM	MF004
CR	CORE	CR/RR	MF005
CS	CORE SPRAY	CS/LP/SD	MF007
CU	REACTOR WATER CLEAN-UP SYSTEM	CU	MF008
CW	CIRCULATING WATER	SW/CW	MF009
ED	ELECTRICAL DISTRIBUTION	ED	MF011
EG	ELECTRICAL GENERATION	EG	MF016
FW	FEEDWATER	FW	MF017
IA	INSTRUMENT AIR	IA	MF021
LP	LOW PRESSURE COOLANT INJECTION	CS/LP/SD	MF022
MS	MAIN STEAM	MS/AP	MF023
NI	NUCLEAR INSTRUMENTATION	NI	MF025
OG	OFF GAS SYSTEM	OG	MF029
PC	PLANT PROCESSOR COMPUTER	PC/AN	MF030
RC	REACTOR BUILDING CLOSED COOLING WATER	RC	MF031
RD	CRDHS, RPIS & RMCIS	RD/RW	MF033
RM	RADIATION MONITOR	RM	MF044
RP	REACTOR PROTECTION	RP	MF047
RR	REACTOR RECIRCULATION	CR/RR	MF049
RW	ROD WORTH MINIMIZER	RD/RW	MF052
SC	SECONDARY CLOSED COOLING WATER	CC/SC	MF053
SD	SHUTDOWN COOLING	CS/LP/SD	MF054
SL	STANDBY LIQUID CONTROL	SL	MF055
SW	SERVICE WATER	SW/CW	MF056
TC	TURBINE CONTROL	TU/TC	MF057
TU	TURBINE	TU/TC	MF058
WD	WASTE DISPOSAL	WD	

MALFUNCTION LIST

MF001

MALF. NO.	DESCRIPTION
AN01	CRY-WOLF ALARM NOTE: THIS MALFUNCTION IS ONLY ACCESSED THROUGH THE I/O OVERRIDE FUNCTION.
AN02	ANNUNCIATOR POWER SUPPLY FAILURE A - CRP-903 B - CRP-904 C - CRP-905 D - CRP-906 E - CRP-907 F - CRP-909 G - CRP-924

MALFUNCTION LIST

MALF. NO.		DESCRIPTION
AP01		SRV 1-MS- SETPOINT INCORRECT VARIABLE(100% = TWO TIMES NORMAL SETPOINT)
	A	3A
	B	3B
	C	3C
	D	3D
	E	3E
	F	3F
AP02		SRV 1-MS- VALVE LEAKAGE VARIABLE(100% = 100,000 LBM/HR)
	A	3A
	B	3B
	C	3C
	D	3D
	E	3E
	F	3F
AP03		APR 1-MS- ACTUATION FAILURE
	A	3A
	C	3C
	D	3D
	F	3F
AP04		SRV 1-MS- VALVE STICKS VARIABLE(0 TO 100% VALVE POSITION)
	A	3A
	B	3B
	C	3C
	D	3D
	E	3E
	F	3F

MALF. NO.	DESCRIPTION
CC01	TBCCW PUMP TRIP (RELAY FAILURE) A - PUMP A B - PUMP B C - PUMP C
CC02	TBCCW HX TUBE LEAK VARIABLE (100% = 500 GPM) A - HX A B - HX B C - HX C
CC03	TBCCW HEADER LEAK
CC04	LOSS OF TBCCW TO GEN H2 COOLER
CC05	MAIN TURBINE LUBE OIL COOLER CONTROL FAILURE VARIABLE (0-100% OF CONTRLLER OUTPUT) - TURBNE L.O. COOLER CONTROLLER FAILURE
CC06	TBCCW PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B C - PUMP C D - PUMP D
CC07	STATOR COOLING FLOW BLOCKAGE
CC08	STATOR COOLING PUMP TRIP A - PUMP A B - PUMP B
CC09	GEN LEADS FAN BELT FAILURE A - FAN A B - FAN B

MALFUNCTION LIST

MF004

MALF. NO.	DESCRIPTION	
CH01	DH COOLER HVH- A - HVH-18 B - HVH-19 C - HVH-20 D - HVH-21 E - HVH-22 F - HVH-26 G - HVH-27 H - HVH-28	BELT FAILURE

MALF. NO.	DESCRIPTION
CR01	FUEL CALDDING FAILURE VARIABLE (0-100,000 UC/SEC) UNRECOVERRABLE U -FUEL CLADDING FAILURE
CR02	INCREASED CONTROL ROD WORTH U

			1451	1851	2251	2651	3051	3451	3851			
		1047	1447	1847	2247	2617	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

MALFUNCTION LIST

MF007

MALF. NO.	DESCRIPTION
CS01	CS PUMP TRIP A - PUMP A B - PUMP B
CS02	CS PUMP FAIL TO AUTO START A - PUMP A B - PUMP B
CS03	CS INJ VALVE BINDS VARIABLE (0-100% VALVE POSITION) A - 1-CS-5A B - 1-CS-5B
CS04	CS PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B
CS05	CS PIPE BREAK INS9DE RPV VARIABLE (100% = COMPLETE PIPE BREAK) A - CS A B - CS B

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
CU01	RWCU RECIRC PUMP TRIP A - PUMP A B - PUMP B
CU02	RWCU AUX PUMP TRIP
CU03	RWCU DEMIN DEPLETION VARIABLE (100% = COMPLETE DEPLETION) A - DEMIN A B - DEMIN B C - DEMIN C
CU04	RWCU INFLUENT LEAK AT INLET TO REGEN HX VARIABLE (100% = 500 GPM)
CU05	RWCU NRHX TUBE LAK VARIABLE (100% = 100 GPM)
CU06	RWCU PCV 1-CU-10 CONTROLLER FAILURE VARIABLE (0-100% VALVE POSITION)
CU07	RWCU REJECT VALVE CONTROLLER FAILURE VARIABLE (0-100% VALVE POSITION)
CU08	RWCU RETURN VALVE 1-CU-20 BINDS VARIABLE (0-100% VALVE POSITION)
CU09	RWCU RECIRC PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B
CU10	RWCU AUX PUMP LOSS OF CONTROL POWER

MALF. NO.	DESCRIPTION
CW01	CIRC WATER PUMP TRIP A - PUMP A B - PUMP B C - PUMP C D - PUMP D
CW02	INTAKE SCREEN FOULING VARIBLE (100% = 30" LEVEL DIFFERENCE) A - SCREEN A B - SCREEN B C - SCREEN C D - SCREEN D E - SCREEN E
CW04	CONDENSER TUBE RUPTURE VARIABLE (100% = 1000 GPM) A - CONDENSER A B - CONDENSER B C - CONDENSER C D - CONDENSER D
CW06	LOSS OF VACCUM PRIMING
CW07	CONDENSER TUBE FOULING VARIABLE (100% = COMPLETE BLOCKAGE) A - CONDENSER A B - CONDENSER B C - CONDENSER C D - CONDENSER D
CW08	CW PUMP DISCHG VALVE BINDS VARIABLE (0-100% VALVE POSITION) A - PUMP A B - PUMP B C - PUMP C D - PUMP D

MALFUNCTION LIST

MALF. NO.	DESCRIPTION	MF010
CW10	CW OUTLET VALVE BINDS VARIABLE (0-100% VALVE POSITION) A - CONDENSER A B - CONDENSER B C - CONDENSER C D - CONDENSER D	
CW11	CW X-CONN VALVE BINDS VARIABLE (0-100% VALVE POSITION) A - CW INLET VALVE 2A B - CW OUTLET VALVE 3A C - CW INLET VALVE 2B D - CW OUTLET VALVE 3B	
CW12	CIRC PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B C - PUMP C D - PUMP D	

MALF. NO.	DESCRIPTION
ED01	E.S.S.T. TRIP
ED02	N.S.S.T. TRIP
ED04	R.S.S.T. TRIP
ED05	4KV BUS NORMAL FEEDER TRIP A - 14A B - 14B C - 14C D - 14D E - 14E F - 14F G - 14G
ED06	480V BUS NORMAL FEEDER TRIP C - 12C D - 12D E - 12E F - 12F
ED07	125VDC BUS TRIP A - 101A B - 101B
ED08	INSTRUMENT AC BUS TRIP
ED09	VITAL AC BUS TRIP
ED10	EMERG BUS MCC TRIP A - E1 B - E2 C - E3 D - E4 E - E5 F - E6

MALF. NO.	DESCRIPTION
ED10EF7	EMERG BUS MCC EF7 TRIP
ED10F	EMERG BUS MCC F TRIP A - F1 B - F2 C - F3 D - F4 E - F5 F - F6
ED10EF9	EMERG BUS MCC EF9 TRIP
ED11	AUTO TRANSFER TO RSST FAILURE
ED12	DG LOA DING SEQUENCE TIMER FAILURE VARIABLE (100% = 25 SECONDS REMAINING)
ED14	345KV LINE FAULT A - LINE 348 B - LINE 383 C - LINE 371 D - LINE 310
ED15	MAIN TRANSFORMER FAN FAILURE
*ED16	GETAC FAILURE A - FAILURE 5T-2 B - FAILURE 5T-2 SYNC SEL C - FAILURE 6T-2 D - FAILURE 6T-2 SYNC SEL E - FAILURE 8T-2 F - FAILURE 8T-2 SYNC SEL G - FAILURE 9T-2 H - FAILURE 9T-2 SYNC SEL I - FAILURE IJS GES SYNC SEL J - FAILURE 348 HS RECLOSE K - FAILURE 371 HS RECLOSE L - FAILURE 383 HS RECLOSE

* Certification Not Required

MALF. NO.	DESCRIPTION	
*ED16	GETAC FAILURE	
	N - FAILURE SW 371-1S-G-S	
	P - FAILURE 15G-1T-2	
	R - FAILURE 15G-3T-2	
	S - FAILURE SW 303-1[illegible]-S	
	T - FAILURE 15G-4T-2	
	U - FAILURE SW 348-1S-[illegible]	
	V - FAILURE BKR 17T-2	
	W - FAILURE SW (LATER)	
	X - FAILURE 13T-2 SYNC SEL	
	Y - FAILURE 310 MS RECLOSE	
	Z - FAILURE 14T-2 SYNC SEL	
	AA - FAILURE 14T-2	
*ED17	GETAC SPURIOUS ANNUNCIATOR	
	AA - (BLANK)	BA - LOSS OF ANNUN DC
	AB - (BLANK)	BB - ACB 4T-2
	AC - (BLANK)	BC - FUTURE
	AD - B BUS PROT DC FAIL	BD - FUTURE
	AE - (BLANK)	BE - FUTURE
	AF - (BLANK)	BF - FUTURE
	AG - ACB 1T-2	BG - FUTURE
	AH - 6X17X TRANS TROUBLE	BH - FUTURE
	AI - (BLANK)	BI - S BUS PROT DC FAIL
	AJ - (BLANK)	BJ - (BLANK)
	CA - MOD OVERLOAD	DA - BATTERY TROUBLE
	CB - GEN 2 TIE PRI DC & PW	DB - 440 VAC TRANS & SW
	CC - AUTO SYNC FAIL	DC - ACB'S DC BKR'S TRIP
	CD - GEN SYNC GUARD FREQ	DD - LINE PROT SEL SW OFF
	CE - GEN 2 TIE BU DC & PW	DE - MOD CONTACT TRANSFER
	CF - SEL SW OFF	DF - GEN 3 TIE PRI DC & PW
	CG - GEN 1 TIE PRI DC & PW	DG - BKR FAIL LO TRIP
	CH - GEN 1 TIE BU DC & PW	DH - BKR FAIL DC SUPPLY
	CI - ACB PRI TRIP DC FAIL	DI - GEN 3 TIE BU DC & PW
	CJ - PWR LIMIT MON DC FAIL	DJ - LOCAL CONTROL

* Certification Not Required

MALFUNCTION LIST MF014

MALF. NO.	DESCRIPTION
*ED17B	GETAC PURIOUS ANNUNCIATOR
	EA - RSS TRANS LOSS GUARD
	EB - OIL ALARM
	EC - ACB 8T-2
	ED - ACB 9T-2
	EE - GEN NO. 1 OUT OF STEP
	EF - GEN NO. 2 OUT OF STEP
	EG - LINE 348 CARR 26
	EH - (BLANK)
	EI - START UP TRANSF 2
	EJ - ACB 7T-2
	FA - 371 PRI RLY
	FB - 371 BU RLY
	FC - LN 383 PRI CARR 26 REL
	FD - LINE 383 BU TONE REL
	FE - 371 LN TT LOSS OF GUARD
	FF - ACB 5T-2
	FG - 383 LN TT LOSS OF GUARD
	FH - (BLANK)
	FI - ACB 6T-2
	FJ - ACB 3T-2

* Certification Not Required

MALF. NO.	DESCRIPTION
EG01	MAIN GENERATOR TRIP
EG02	MAIN GEN AUTO VOLTAGE REG OSCILLATION VARIBLE (100% = PLUS OR MINUS 2 KV SWING)
EG04	MN GEN FIELD BREAKER TRIP
EG05	DIESEL FAILS TO START
EG06	DIESEL GENERATOR TRIP
EG07	DIESEL GENERATOR SLOW START VARIABLE (100% = 10 ADDITIONAL SECONDS)
EG08	DIESEL GENERATOR SPEED CONTROL FAILURE VARIABLE (100% = 10% SPEED OSCILLATION)
EG09	GAS TURBINE FAILS TO START
EG10	GAS TURBINE TRIP
EG11	GAS TURBINE SLOW START VARIABLE (100% = 10 ADDITIONAL SECONDS)
EG12	GAS TURBINE SPEED CONTROL FAILURE VARIABLE (100% = PLUS OR MINUS 10% CHANGE)

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
FW01	CONDENSATE PUMP TRIP A - PUMP A B - PUMP B C - PUMP C
FW02	COND BOOSTER PUMP TRIP A - PUMP A B - PUMP B C - PUMP C
FW03	COND DEMIN HI D VARIABLE (100% =50% BLOCKAGE) A - DEMIN A B - DEMIN B C - DEMIN C D - DEMIN D E - DEMIN E F - DEMIN F G - DEMIN G
FW04	COND DEMIN DEPLETION VARIABLE (100% = NO CONDUCTIVITY REDUCTION) A - DEMIN A B - DEMIN B C - DEMIN C D - DEMIN D E - DEMIN E F - DEMIN F G - DEMIN G
*FW05	CST LEAK VARIABLE (100% = 10,000 GPM)
SPARE	
FW07	CONDENSATE PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B C - PUMP C

* Certification Not Required

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
FW08	COND BOOSTER PUMP LOSS OF CONTROL PWR A - PUMP A B - PUMP B C - PUMP C
FW09	HEATER DRAIN PUMP TRIP A - PUMP A B - PUMP B C - PUMP C
FW11	HEATER NORM LVL CONT FAIL VARIABLE (100% = VALVE FULLY OPEN) A - LP HTR 1A B - LP HTR 1B C - LIP HTR 2A D - LIP HTR 2B E - IP HTR 3A F - IP HTR 3B
FW12	HEATER EMERG LVL CONT FAIL VARIABLE (100% = VALVE FULLY OPEN) A - LP HTR 1A B - LP HTR 1B C - LIP HTR 2A D - LIP HTR 2B E - IP HTR 3A F - IP HTR 3B
FW13	HEATER NORM LVL CONT FAIL VARIABL (100% = VALVE FULLY OPEN) A - HP HTR 5A B - HP HTR 5B C - HIP HTR 4A D - HIP HTR 4B
FW14	HEATER EMERG LVL CONT FAIL VARIABLE (100% = VALVE FULLY OPEN) A - HP HTR 5A B - HP HTR 5B C - HIP HTR 4A

MALF. NO.	DESCRIPTION
FW15	RFP MIN FLOW RECIRC VALVE FAILS OPEN A - RFP A B - RFP B C - RFP C
FW17	RFP TRIP A - RFP A B - RFP B C - RFP C
FW18	FEEDWATER RUPTURE INSIDE HEATER BAY U VARIABLE (100% = 7.6E6 LBM/HR)
FW19	FEEDWATER RUPTURE INSIDE CONTAINMENT U VARIABLE (100% = 7.6E6 LBM/HR)
FW20	10% FEED VALVE CONTROLLER FAILURE VARIABLE (100% = VALVE FULLY OPEN)
FW21	FEED REG VALVE 6 LOSS OF AIR A - 6A B - 6B
FW21C	10% CONTROL VALVE 6C LOSS OF AIR
FW22	FEEDWATER CONTROLLER AUTO FAILURE VARIABLE (100% = VALVE FULL OPEN DEMAND) A - CONTROLLER A B - CONTROLLER B
FW23	FEEDWATER CONTROL VALVE OSCILLATION VARIABLE (100% = OSCILLATION OF 50% VALVE POSITION) A - VALVE A B - VALVE B
FW24	HEATER TUBE LEAK A - LP HTR 1A D - LIP HTR 2B B - LP HTR 1B E - IP HTR 3A C - LIP HTR 2A F - IP HTR 3B

MALF. NO.	DESCRIPTION
FW25	HEATER TUBE LEAK VARIBLE (100% = 5.0E5 LBM/HR) A - HP HTR 5A B - HP HTR 5B C - HIP HTR 4A D - HIP HTR 4B
FW26	FWCI AUTO START FAILURE
FW27	FWCI COND TRANSFER PUMP TRIP
FW28	FWCI COND XFER PP DISCHARGE VALVE BINDS VARIABLE (0-100% VALVE POSITION)
FW29	RFP LOSS OF CONTROL POWER A - RFP A B - RFP B C - RFP C
FW30	MAIN CONDENSER AIR INLEAKAGE VARIABLE (100% = 1000 SCFM) A - CONDENSER A B - CONDENSER B
FW31	MAIN COND LEVEL CONTROLLER FAILURE VARIABLE (0-70 IN. INDICATED HOTWELL LEVEL) A - COND A B - COND B
FW32	CONDENSATE PUMP TRIP ON LOW HOTWELL LEVEL A - COND PUMPS A AND C TRIP B - COND PUMP B TRIP

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
A01A	STATION AIR COMPRESSOR TRIP
IA01B	INSTRUMENT AIR COMPRESSOR TRIP
IA02	SULLAIR AIR COMPRESSOR TRIP
IA03	INSTRUMENT AIR HEADER LEAK U VARIABLE (100% = 2500 SCFM), UNRECOVERABLE
IA04	SERVICE AIR HADER LEAK U VARIABLE (100% = 2500 SCFM), UNRECOVERABLE
IA05	INSTRUMENT AIR LEAK IN CONTAINMENT U VARIABE (50% = D.W. COMPRESSOR CAPCITY)
IA06	DRYWELL COMPRESSOR TRIP
* IA07	AIR XCONN FAILS CLOSED A - 1-IA-19 B - 1-SA-21
IA09	AIR COMP LOSS OF CONTROL POWER A - STATION B - INSTR

* Certification Not Required

MALF. NO.	DESCRIPTION
LP01	LPCI PUMP TRIP A - PUMP A B - PUMP B C - PUMP C D - PUMP D
LP02	LPCI PUMP FAILS TO AUTO START A - PUMP A B - PUMP B C - PUMP C D - PUMP D
LP04	LPCI HX BYPASS VLV BINDS VARIABLE (0-100% VALVE POSITION) A - HX A B - HX B
LP05	LPCI TORUS SPRAY VLV BINDS VARIABE (0-100% VALVE POSITION) A - 1-LP-13A B - 1-LP-13B C - 1-LP-14A D - 1-LP-14B
LP06	LPCI INJECTION VLV BINDS VARIABLE (0-100% VALVE POSITION) A - 1-LP-10A B - 1-LP-10B C - 1-LP-9A D - 1-LP-9B
LP07	LPCI PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B C - PUMP C D - PUMP D

MALF. NO.	DESCRIPTION	
MS01	UNISOLABLE MAIN STREAM RUPTURE IN DW VARIABLE (100%=25.9E6 LBM/HR), UNRECOVERABLE	U
MS02	STEAM LINE RUPTURE IN DW VARIABLE (100%=25.9E6 LBM/HR), UNRECOVERABLE A - LINE A B - LINE B C - LINE C D - LINE D	U
MS03	STEAM LINE RUPTURE IN STEAM TUNNEL VARIABLE (100%=25.9E6 LBM/HR), UNRECOVERABLE A - LINE A B - LINE B C - LINE C D - LINE D	U
MS04	STEAM RUPTURE IN HEATER BAY VARIABLE (100%=25.9E6 LBM/HR), UNRECOVERABLE	U
MS05	MSIV CLOSURE VARIABLE (100% = VALVE FULLY CLOSED) A - MSIV 1A B - MSIV 1B C - MSIV 1C D - MSIV 1D E - MSIV 2A F - MSIV 2B G - MSIV 2C H - MSIV 2D	
MS06	SEAL STEAM VALVE FAILS CLOSED A - STEAM SUPPLY B - STEAM UNLOADER	
MS07	SJAE STEAM SUPPLY VALVE FAILS VARIABLE (0-100% VALE POSITION) A - SJAE A B - SJAE B	

MALF. NO.	DESCRIPTION
MS08	SPURIOUS GROUP ONE ISOLATIO
MS09	TURBINE EXHAUST HOOD SPRAY VLV 1-CN-47 FAILS CLOSED
MS10	MS DRN TK NORM LVL CONT VALVE FAILURE VARIABLE (0-100% VALVE POSITION) A - TK A B - TK B C - TK C D - TK D
MS11	MS DRN TK EMERG LVL CONT VALVE FAILURE VARIABLE (0-100% VALVE POSITION) A - TK A B - TK B C - TK C D - TK D

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
NI01	APRM FAILURE VARIABLE (0-100% AMPLIFIER OUTPUT) A - APRM 1 B - APRM 2 C - APRM 3 D - APRM 4 E - APRM 5 F - APRM 6
NI02	IRM FAILURE VARIABLE (0-100% AMPLIFER OUTPUT) A - IRM 11 B - IRM 12 C - IRM 13 D - IRM 14 E - IRM 15 F - IRM 16 G - IRM 17 H - IRM 18
NI03	SRM FAILURE VARIABLE (0-100% AMPLIFIER OUTPUT) A - SRM 21 B - SRM 22 C - SRM 23 D - SRM 24
NI04	LPRM FAILURE VARIABLE (0-100% AMPLIFIER OUTPUT) A01 - 2A-04-37 A09 - 2C-20-37 A02 - 3A-36-37 A10 - 4C-02-21 A03 - 4A-20-21 A11 - 5C-36-21 A04 - 6A-36-05 A12 - 6C-20-05 A05 - 1B-20-45 A13 - 1D-12-43 A06 - 2B-12-29 A14 - 3D-28-29 A07 - 3B-44-29 A15 - 4D-12-13 A08 - 4B-28-13 A16 - 5D-44-13

MALFUNCTION LIST

MF026

MALF. NO.	DESCRIPTION	
NI04	LPRM FAILURE	
	B01 - 1A-12-45	B09 - 1C-20-45
	B02 - 3A-20-28	B10 - 2C-12-29
	B03 - 4A-12-13	B11 - 3C-44-29
	B04 - 5A-44-13	B12 - 4C-20-13
	B05 - 2B-04-37	B13 - 2D-20-37
	B06 - 3B-36-37	B14 - 4D-04-21
	B07 - 4B-20-21	B15 - 5D-36-21
	B08 - 6B-36-05	B16 - 6D-20-05
	C01 - 2A-02-37	C09 - 2C-04-37
	C02 - 4A-04-21	C10 - 3C-36-37
	C03 - 5A-36-21	C11 - 4C-20-21
	C04 - 6A-20-05	C12 - 6C-36-05
	C05 - 1B-12-45	C13 - 1D-20-45
	C06 - 3B-20-29	C14 - 2D-12-29
	C07 - 4B-12-13	C15 - 3D-44-29
	C08 - 5B-44-13	C16 - 4D-26-13
	D01 - 1A-20-45	D08 - 2C-36-45
	D02 - 3A-04-29	D09 - 3C-20-29
	D03 - 4A-36-29	D10 - 6C-36-13
	D04 - 5A-20-13	D11 - 3D-20-27
	D05 - 2B-12-37	D12 - 4D-12-21
	D06 - 3B-44-37	D13 - 5D-44-21
	D07 - 4B-20-21	D14 - 6D-20-05

MALF. NO.	DESCRIPTION
	LPRM FAILURE
N104	

E01 - 3A-20-37	E06 - 3B-04-29	E11 - 4C-20-21
E02 - 4A-12-21	E07 - 4B-36-29	E12 - 2D-36-45
E03 - 5A-44-21	E08 - 5B-20-13	E13 - 3D-20-29
E04 - 6A-20-05	E09 - 2C-12-37	E14 - 6D-36-13
E05 - 1B-26-45	E10 - 3C-45-37	

F01 - 2A-36-45	F06 - 5B-44-21	F11 - 5C-20-13
F02 - 3A-20-29	F07 - 6B-20-05	F12 - 2D-12-37
F03 - 6A-36-13	F08 - 1C-20-45	F13 - 3D-44-37
F04 - 3B-20-37	F09 - 3C-04-29	F14 - 4D-20-21
F05 - 4B-12-21	F10 - 4C-36-29	

G01 - 1A-20-45	G06 - 4B-04-21	G11 - 4C-12-13
G02 - 2A-12-29	G07 - 5B-36-21	G12 - 5C-44-13
G03 - 3A-44-29	G08 - 6B-20-05	G13 - 2D-04-37
G04 - 4A-20-13	G09 - 1C-12-45	G14 - 3D-36-37
G05 - 2B-20-37	G10 - 3C-28-29	G15 - 4D-20-21
		G16 - 6D-36-05

H01 - 2A-12-37	H06 - 6B-36-13	H11 - 1D-20-45
H02 - 3A-44-37	H07 - 2C-20-37	H12 - 3D-04-29
H03 - 4A-20-21	H08 - 4C-12-21	H13 - 4D-36-29
H04 - 2B-36-45	H09 - 5C-44-21	H14 - 5D-20-13
H05 - 3B-20-29	H10 - 6C-20-05	

MALF. NO.	DESCRIPTION
NI05	APRM NOISE VARIABLE (100% = +- 50% POWER) A - APRM 1 B - APRM 2 C - APRM 3 D - APRM 4 E - APRM 5 F - APRM 6
NI06	IRM NOISE VARIABLE (100% = +- 50/125) A - IRM 11 B - IRM 12 C - IRM 13 D - IRM 14 E - IRM 15 F - IRM 16 G - IRM 17 H - IRM 18
NI07	RBM FAILURE VARIABLE (0-100% AMPLIFIER OUTPUT) A - RBM A B - RBM B
NI09	APRM CH SETDOWN FAILURE A - CH 1 (3) B - CH 5 (4) C - CH 2 (3) D - CH 6 (4)
NI10	DETECTOR STUCK VARIABLE (0-100% DETECTOR INSERTION) A - SRM 21 G - IRM 13 B - SRM 22 H - IRM 14 C - SRM 23 I - IRM 15 D - SRM 24 J - IRM 16 E - IRM 11 K - IRM 17 F - IRM 12 L - IRM 18

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
* 0001	CYCLIC DRYER FAILURE A - HEATER A B - HEATER B
0002	SYSTEM EXPLOSION
0003	STACK ISOLATION VALVE FCV-8-6 FAILS CLOSED
* 0004	-30 DEG F GLYCOL FAILS A - UNIT A B - UNIT B
* 0005	+30 DEG F GLYCOL FAILS A - UNIT A B - UNIT B
0006	FLOW OSCILLATION VARIABLE (100% = 100% OUTPUT SWING) A - A FLOW B - B FLOW
0007	RECOMBINER OUTLET FAILS CLOSED A - VALVE A B - VALVE B
0008	LOSS OF OFFGAS CONDESER COOLING WATER

* Certification Not Required

MALF. NO.	DESCRIPTION
PC01	LOSS OF PLANT PROCESS COMPUTER

MALFUNCTION LIST MF031

MALF. NO.	DESCRIPTION
RC01	RBCCW PUMP TRIP A - PUMP A B - PUMP B
RC02	RBCCW MAKEUP VALVE FAILURE VARIABLE (0-100% OF VALVE POSITION)
RC03	RBCCW HX TUBE LEAK VARIABLE (100% = 500 GPM) A - HX A B - HX B C - HX C
RC04	DW COOLER LOSS OF FLOW VARIABLE (100% = COMPLETE LOSS OF FLOW) A - HVH-18 B - HVH-19 C - HVH-20 D - HVH-21 E - HVH-22 F - HVH-26 G - HVH-27 H - HVH-28
RC05	DW COOLER COIL LEAKAGE VARIABLE (100% = 50 GPM) A - HVH-18 B - HVH-19 C - HVH-20 D - HVH-21 E - HVH-22 F - HVH-26 G - HVH-27 H - HVH-28
RC06	RBCCW DRYWELL HEADER LEAK VARIABLE (50% = SURGE TANK MAKEUP CAPACITY

MALF. NO.	DESCRIPTION
'07	SPARE
RC08	RBCCW HEAT EXCHANGER OUTLET LEAK VARIABLE (50% = SURGE TANK MAKEUP FLOW RATE)
RC09	RBCCW PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B

MALF. NO.	DESCRIPTION
RD01	ALL RODS STUCK AT PRESENT POSITIONS
* RD02	ROD DRIVE PRESSURE CONTROL VALVE FAILURE VARIABLE (0-100% VALVE POSITION)
RD03	SCRAM OUTLET VALVE LEAK VARIABLE (100% = 20 GPM)

			1451	1851	2251	2651	3051	3451	3851			
		1047	1447	1847	2247	2617	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

* Certification Not Required

MALF. NO.	DESCRIPTION
RD04	ROD DRIVE SEALS WORN VARIABLE (100% = 20 GPM)

			1451	1851	2251	2651	51	3451	3851			
		1047	1447	1847	2247	2617	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

MALFUNCTION LIST MF035

MALF. NO.	DESCRIPTION
RD05	CONTROL ROD BLADE STUCK AT PRESENT POS

			1451	1851	2251	2651	3051	3451	3851			
		1047	1447	1847	2247	2647	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
RD06	CONTROL ROD UNCOUPLED

			1451	1851	2251	2651	3051	3451	3851			
		1047	1447	1847	2247	2617	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

MALF. NO.	DESCRIPTION
RD07	CONTROL ROD ACCUMULATOR LOW PRESSURE

			1451	1851	2251	2651	3051	3451	3851			
		1047	1447	1847	2247	2617	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

MALF. NO.	DESCRIPTION											
RD08	SCRAM INDIVIDUAL CONTROL ROD											
			1451	1851	2251	2651	3051	3451	3851			
		1047	1447	1847	2247	2617	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

RD09 CRD HYDRAULIC PUMP TRIP
A - PUMP A
B - PUMP B

RD10 CRD FLOW CONTROLLER FAILURE
VARIABLE (0-100% VALVE POSITION)

MALF. NO.	DESCRIPTION
* RD11	CRD STABILIZING VALVE FAILS CLOSED
	A - CRD A INSERT B - CRD A WITHDRAW C - CRD B INSERT D - CRD B WITHDRAW
* RD12	SCRAM INDIVIDUAL CONTROL ROD

			1451	1851	2251	2651	3051	3451	3851			
		1047	1447	1847	2247	2617	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

* Certification Not Required

MALF. NO.	DESCRIPTION
RD13	SDV DRAIN BLOCKAGE VARIABLE (100% = COMPLETE BLOCKAGE) A - NORTH B - SOUTH
RD14	VALVE FAILURE VARIABE (0-100% VALVE POSITION) A - 1-SDV-1N VENT B - 1-SDV-2N VENT C - 1-SDV-3N DRAIN D - 1-SDV-4N DRAIN E - 1-SDV-1S VENT F - 1-SDV-2S VENT G - 1-SDV-3S DRAIN H - 1-SDV-4S DRAIN
RD15	SDV RUPTURE A - NORTH B - SOUTH
RD16	CRD PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
RD17	RPIS FAILS AT PRESENT POSITION

			1451	1851	2251	2651	3051	3451	3851			
		1047	1447	1847	2247	2617	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
RD10	RPIS FAILS AT NEXT POSITION

			1451	1851	2251	2651	3051	3451	3851			
		1047	1447	1847	2247	2617	3047	3447	3847	4247		
	0643	1043	1443	1843	2243	2643	3043	3443	3843	4243	4643	
0239	0639	1039	1439	1839	2239	2639	3039	3439	3839	4239	4639	5039
0235	0635	1035	1435	1835	2235	2635	3035	3435	3835	4235	4635	5035
0231	0631	1031	1431	1831	2231	2631	3031	3431	3831	4231	4631	5031
0227	0627	1027	1427	1827	2227	2627	3027	3427	3827	4227	4627	5027
0223	0623	1023	1423	1823	2223	2623	3023	3423	3823	4223	4623	5023
0219	0619	1019	1419	1819	2219	2619	3019	3419	3819	4219	4619	5019
0215	0615	1015	1415	1815	2215	2615	3015	3415	3815	4215	4615	5015
	0611	1011	1411	1811	2211	2611	3011	3411	3811	4211	4611	
		1007	1407	1807	2207	2607	3007	3407	3807	4207		
			1403	1803	2203	2603	3003	3403	3803			

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
RD19	CONTROL RODS FAIL TO WITHDRAW
RD20	FOUR ROD DISPLAY FAIL TO SHIFT
RD21	FAILURE OF MANUAL ROD CONTROL
RD22	CRD PUMP DISCHARGE HEADER RUPTURE U VARIBLE (100%=COMPLETE PIPE BREAK),UNRECOVERABLE

MALF. NO.	DESCRIPTION
RM01	MS LINE LOG RAD MONITOR CH. VARIABLE (0-100% OF PROCESS RANGE) A - CH. A C - CH. C B - CH. B D - CH. D OG L OG RAD MONITOR CH. E - CH. A F - CH. B STACK GASS PROCESS RAD MON CH G - CH A H - CH B REFUELING FLOOR RAD MON CH J - CH A K - CH B REACTOR BLDG VENT RAD MON CH L - CH A M - CH B ISO CONDENSER RAD. MON. CH. N - CH A P - CH B Q - CONTROL ROOM VENT RAD MONITOR R - RBCCW RAD MONITOR S - SW RAD MONITOR T - RADWASTE LIQUID RAD. MONITOR U - TURB BLDG VENT RAD LVL V - XK BLDG VENT RAD LVL

MALFUNCTION LIST

MAL NO	DESCRIPTION
RM02	AREA RADIATION MONITOR FAILURE VARIABLE (0-100% OFMETER SCALE)
	A - WEST REFUEL FLOOR ARM
	B - WEST REFUEL FLOOR HI RNG ARM
	C - EAST REFUEL FLOOR ARM
	D - NEW FUEL STORAGE ARM
	E - CLOTHING CHANGE AREA ARM
	F - ISOLATION CNDENSER AREA ARM
	G - CLEANUP INSTRUMENT RACK ARM
	H - ISO-CONDSR PIPING RETURN ARM
	J - CLEANUP EQUIPMENT AREA ARM
	K - TIP CUBICLE ARM
	L - TIP DRIVE MECHANISM AREA ARM
	M - DRYWELL HIGH RANGE AREA
	N - NORTH CRD HCU AREA ARM
	P - SHUTDOWN PUMP CUBICLE ARM
	Q - REACTOR BIULDING ACCESS ARM
	R - CRD PUMP AREA ARM
	S - TORUS AREA ARM
	T - CONTROL ROOM ARM
	U - TURB BLDG OPERATING FLOOR ARM

MALFUNCTION LIST

MF046

MALF. NO.	DESCRIPTION
RM02	
	V - ACCESS TO MAN COND COMPT ARM
	W - CONDENSATE BOOSTER PUMP ARM
	X - DECON AREA ACCESS ARM
	Y - MACHINE SHOP AND WHAREHOUSE ARM
	Z - RADWASTE CONTROL ROOM ARM
	A1 - FILTER SLUDGE PUMP CUBICLE ARM
	A2 - DECON. SOLVENT PUMP AREA ARM
	A3 - RADWASTE SAMPLE PUMP AREA ARM
	A4 - RW STORAGE BLDG ARM
	A5 - RW STORAGE BLDG DRUM DISCH ARM
	A6 - RW STORAGE BLDG COMPACTOR ARM
RM03	ISO-KINETIC STACK GAS PP TRIP

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
RP01	SPURIOUS REACTOR SCRAM
RP02	FAILURE OF ALL AUTOMATIC SCRAMS
RP03	FAILURE OF ALL AUTOMATIC SCRAMS BUT ATWS
RP04	ATWS DIV LOSS OF POWER A - DIV I B - DIV II
RP05	LOSS OF RPS MG A - MG A B - MG B
RP06	LOSS OF RPS BUS A - BUS A B - BUS B
RP07	SELECT ROD INSERT BUS FAILURE A - BUS A B - BUS B

MALF. NO.	DESCRIPTION
RR01	RECIRC MG MOTOR TRIP A - MG A B - MG B
RR02	RECIRC PUMP LOCKED ROTOR A - PUMP A B - PUMP B
RR03	RECIRC PUMP SHAFT BREAK A - PUMP A B - PUMP B
RR04	RECIRC MG INCOMPLETE SEQUENCE A - MG A B - MG B
RR05	RECIRC PUMP SEAL FAILURE VARIABLE (100% = COMPLETE SEAL FAILURE) A - PUMP A #2 B - PUMP B #2
RR06	RECIRC PUMP SEAL FAILURE VARIABLE (100% = COMPLETE SEAL FAILURE) A - PUMP A #1 B - PUMP B #1
RR07	RECIRC PUMP LOW COOLING FLOW VARIABLE (100% = COMPLETE BLOCKAGE) A - PUMP A B - PUMP B
RR08	RECIRC MASTER CONTROLLER FAILURE VARIABLE (0-100% CONTROLLER OUTPUT)

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
RR09	RECIRC PUMP LOOP SPEED CONTROLLER FAILURE VARIABLE (0-100% CONTROLLER OUTPUT) A - LOOP A B - LOOP B
RR10	RECIRC PUMP SPEED CONTROL FAILURE VARIABLE (0-100% CONTROLLER OUTPUT) A - A SPEED B - B SPEED
RR11	RECIRC PUMP SCOOP TUBE LOCKUP A - PUMP A B - PUMP B
RR12	RECIRC PUMP RUNBACK FAILURE A - PUMP A B - PUMP B
RR13	JET PUMP RISER FAILURE U A - JP 1 - 2 B - JP 3 - 4 C - JP 5 - 6 D - JP 7 - 8 E - JP 9 - 10 F - JP 11 - 12 G - JP 13 - 14 H - JP 15 - 16 J - JP 17 - 18 K - JP 19 - 20

MALF. NO.	DESCRIPTION	
* RR14	ERRATIC RECIRC JET PUMP FLOW A - PUMP 1 B - PUMP 2 C - PUMP 3 D - PUMP 4 E - PUMP 5 F - PUMP 6 G - PUMP 7 H - PUMP 8 J - PUMP 9 K - PUMP 10 L - PUMP 11 M - PUMP 12 N - PUMP 13 P - PUMP 14 Q - PUMP 15 R - PUMP 16 S - PUMP 17 T - PUMP 18 U - PUMP 19 V - PUMP 20	U
RR15	REACTOR VESSEL HEAD VENT LEAK VARIABLE (100% = COMPLETE BREAK)	U
RR16	RECIRC LOOP BREAK VARIABLE (100% = COMPLETE PIPE BREAK) A - LOOP A B - LOOP B	U
RR17	RECIRC MG LOSS OF CONTROL POWER A - MG A B - MG B	
RR18	RPV INST REFERENCE TAP BREAK VARIABLE (100% = COMPLETE BREAK) A - TAP A B - TAP B	U

* Certification Not Required

MALF. NO.	DESCRIPTION	
RR19	RPV INSTRUMENT LINE BREAK VARIABLE (100% = COMPLEE BREAK) A - TAP A B - TAP B	U
RR20	CALIBRATED JET PUMP INST LINE BREAK VARIABLE (100% = COMPLETE BREAK) A - JP 6 B - JP 16	U
RR21	RPV N.R. YARWAY LEVEL TRANSMITTER FAILURE VARIABLE (0-100% TRANSMITTER OUTPUT) A - YARWAY A B - YARWAY B	
RR22	RPV N.R. ROSEMONT LEVEL TRANSMITTER FAILURE VARIABLE (0-100% TRANSMITTER OUTPUT) A - ROSEMONT A B - ROSEMONT B C - ROSEMONT C D - ROSEMONT D	
RR23	RPV N.R. GEMAC LEVEL TRANSMITTER DRIFT VARIABLE (0-100% = (-60) - 60") A - GEMAC A B - GEMAC B	
RR24	WR YARWAY TRASNSMITTER FAILURE VARIABLE (0-100% TRANSMITTER OUTPUT) A - YARWAY A B - YARWAY B	
RR25	WR ACCIDENT GEMAC TRANSMITTER FAILURE VARIABLE (0-100% TRANSMITTER OUTPUT)	
.R26	WR FLOODUP GEMAC TRANSMITTER FAILURE VARIABLE (0-100% TRANSMITTER OUTPUT)	

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
RW01	RWM FAILS TO APPLY BLOCKS
RW02	RWM WITHDRAW AND INSERT BLOCK
RW03	SPARE
RW04	RWM CRITICAL SELF TEST FAILURE

MALF. NO.	DESCRIPTION
SC01	TBSCCW PUMP TRIP A - PUMP A B - PUMP B
SC02	TBSCCW HX TUBE LEAK VARIABLE (100% = 500 GPM) A - HX A B - HX B
SC03	FAILURE OF TBSCCW TO CONDENSATE PUMP VARIABLE (100% = COMPLETE LOSS OF FLOW) A - PUMP A B - PUMP B C - PUMP C
SC04	FAILURE OF TBSCCW TO COND BOOSTER PUMP VARIABLE (100% = COMPLETE LOSS OF FLOW) A - PUMP A B - PUMP B C - PUMP C
SC05	FAILURE OF TBSCCW TO RX FEED PUMP VARIABLE (100% = COMPLETE LOSS OF FLOW) A - PUMP A B - PUMP B C - PUMP C
SC06	TBSCCW HEADER LEAK AT HX OUTLET VARIABLE (50% = SURGE TANK MAKEUP FLOW RATE)
*SC07	TBSCCW SURGE TANK LVL SWITCH FAILURE VARIABLE (0-100% OF RANGE) A - TANK LO B - TANK HI
SC08	TBSCCW PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B

* Certification Not Required

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
SD01	SHUTDOWN COOLING PUMP TRIP A - PUMP A B - PUMP B
SD02	S D COOL PP DISCHG VALVE FAILURE VARIABLE (0-100% VALVE POSITION) A - PP A B - PP B
SD03	S D COOL PP SUCT VALVE FAILS CLOSED A - PP A B - PP B
SD04	S D COOLING INLET 1-SD-1 BINDS VARIABLE (0-100% VALVE POSITION)
SD05	S D COOLING HX TUBE LEAK VARIABLE (100% = 500 GPM) A - HX A B - HX B
SD06	S D COOLING PUMP LOSS OF CONTROL PWR A - PUMP A B - PUMP B
SD07	ISO CONDENSER RETURN 1-IC-3 BINDS VARIABLE (0-100% INDCATED VALVE POSITION)
SD08	ISO CONDENSER TUBE LEAKAGE VARIABLE (100% = (LATER) LBM/HR)
SD09	ISO CONDENSER MAKEUP 1-IC-10 FAILS VARIABLE (0-100% VALVE POSITION)

MALF. NO.	DESCRIPTION
SL01	SLC SQUIB VALVE LOSS OF CONTINUITY A - VALVE A B - VALVE B
SL02	SLC TANK LEAK VARIABLE (100% = 500 GPM)
SL03	SLC PUMP TRIP A - PUMP A B - PUMP B

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
SW01	SERVICE WATER PUMP TRIP A - PUMP A B - PUMP B C - PUMP C D - PUMP D
SW02	SERVICE WATER STRAINER PLUGGED VARIABLE (100% = COMPLETE BLOCKAGE)
SW03	SW TO TBCCW 1-SW-9 FAILURE VARIABLE (0-100% OF VALVE POSITION)
SW04	LOSS OF SW TO DIESEL GENERATOR
SW05	HEAT EXCHANGER TUBE FOULING VARIABLE (100% = COMPLETE LOSS OF FLOW) A - TBCCW HX A B - TBCCW HX B C - TBCCW HX C D - TBSCCW HX A E - TBSCCW HX B F - RBCCW HX A G - RBCCW HX B H - RBCCW HX C
SW06	SW PUMP LOSS OF CONTROL POWER A - PUMP A B - PUMP B C - PUMP C D - PUMP D
SW07	ESW LPCI D P CONTROLLER FAILURE VARIABLE (0-100% CONTROLLER OUTPUT)? A - LPCI A B - LPCI B

MALF. NO.	DESCRIPTION
TC01	EPR TRANSDUCER FAILURE VARIABLE (0-100% TRANSDUCER OUTPUT)
TC02	EPR OSCILLATION VARIABLE (100% = 100 PSI SWING)
TC03	MPR TRANSDUCER FAILURE VARIABLE (0-100% OF RANGE)
TC04	MPR OSCILLATION VARIABLE (100% = PSI SWING)
TC05	CONTROL VALVE FAILURE VARIABL (0-100% VALVE POSITI[illegible] A - 01 B - 02 C - 03 D - 04
TC06	BYPASS VALVE FAILURE VARIABLE (0-100% VALVE POSITION) A - 01 B - 02 C - 03 D - 04 E - 05 F - 06 G - 07 H - 08 I - 09 J - 010
C07	TURBINE TRIP FAILS A - VACUUM TRIP 01 B - EMERG GOVERNOR
TC08	TURBINE TRIP (EMERG GOVERNOR FAILURE)
TC09	TURBINE LOAD DEMAND FAILS HIGH

MALFUNCTION LIST

MALF. NO.	DESCRIPTION
TU01A	AUX OIL PUMPS A & B TRIP
TU01B	TURNING GEAR OIL PUMP TRIP
TU01C	EBOP OVERLOAD (TRIPS AFTER 30 MINUTES)
TU02	LOW SHAFT OIL PUMP DISCHARGE PRESSURE VARIABLE (100% = COMPLETE FLOW BLOCKAGE)
TU03	TURB BEARING LOW OIL FLOW VARIABLE (100% = 75% FLOW BLOCKAGE) A - 01 B - 02 C - 03 D - 04 E - 05 F - 06 G - 07 H - 08 J - 09 K - 010
TU04	TURB BEARING HI VIBRATION VARIABLE (100% = 20 MILS) A - 01 B - 02 C - 03 D - 04 E - 05 F - 06 G - 07 H - 08 J - 09 K - 010

MALFUNCTION LIST

MF059

MALF. NO.	DESCRIPTION
U05	LIFT PUMP ATO START FAILS A - 01 B - 02 C - 03 D - 04
TU06	A - TRUBINE END TB WEAR DET LOCKOUT FAILS B - GEN END TB WEAR DET LOCKOUT FAILS

THIS IS REV: 0 OF THE MF C&E DOCUMENT
FILENAME: NENMFMST

AN02 ANNUNCIATOR POWER SUPPLY FAILURE REV: 1

A - CRP-903 ANNUNCIATOR POWER FAILURE

B - CRP-904 ANNUNCIATOR POWER FAILURE

C - CRP-905 ANNUNCIATOR POWER FAILURE

D - CRP-906 ANNUNCIATOR POWER FAILURE

E - CRP-907 ANNUNCIATOR POWER FAILURE

F - CRP-908 ANNUNCIATOR POWER FAILURE

G - CRP-924 ANNUNCIATOR POWER FAILURE

TYPE: GENERIC

CAUSE: BLOWN FUSE

PLANT STATUS: ANY

EFFECTS: ALL ANNUNCIATORS IN THE SPECIFIED WINDOW ASSEMBLY WILL BE EXTINGUISHED AND WILL NOT ACTUATE ON ANY TRIP SIGNAL. AUDIBLE ALARMS FOR THAT ASSEMBLY WILL BECOME SILENT. THE LIGHT ON THE ANNUNCIATOR POWER SUPPLY WILL GO OUT. NO OTHER EFFECTS WILL BE SEEN.

REMOVAL OF THIS MALFUNCTION WILL CAUSE ALL ANNUNCIATOR WINDOWS IN AN ALARM CONDITION IN THE SPECIFIED ASSEMBLY TO ACTUATE, REGARDLESS OF THEIR STATUS BEFORE THIS MALFUNCTION WAS ACTIVE. ALARM CONDITIONS WHICH CLEAR WHILE THIS MALFUNCTION IS ACTIVE WILL NOT BE INDICATED.

REF: CWD 30

AP01 APR/SAFETY RELIEF VALVE SETPOINT INCORRECT

VARIABLE (100% = TWO TIMES NORMAL SETPOINT)

A - SRV 1-MS-3A SETPOINT INCORRECT

B - SRV 1-MS-3B SETPOINT INCORRECT

C - SRV 1-MS-3C SETPOINT INCORRECT

D - SRV 1-MS-3D SETPOINT INCORRECT

E - SRV '-MS-3E SETPOINT INCORRECT

F - SRV 1-MS-3F SETPOINT INCORRECT

TYPE: GENERIC, VARIABLE (100% = TWO TIMES NORMAL SETPOINT)

CAUSE: IMPROPER ADJUSTMENT

PLANT STATUS: 100% POWER

EFFECTS: RELIEF VALVE 1-MS-3A WILL ACTUATE IF REACTOR PRESSURE EXCEEDS THE NORMAL SETPOINT TIMES MALFUNCTION SEVERITY DIVIDED BY 50. RELIEF VALVE 1-MS-3A WILL THEN CLOSE WHEN REACTOR PRESSURE DECREASES BELOW THE MALFUNCTION SELECTED VALUE BY THE NORMAL BLOWDOWN PERCENTAGE. IF THE MALFUNCTION SEVERITY IS SET LESS THAN 50%, THE VALVE MAY OPEN DURING NORMAL TRANSIENTS OR MAY BE MADE TO FAIL OPEN (.001% SEVERITY). IF THE SEVERITY IS SET GREATER THAN 50%, REACTOR PRESSURE WILL EXCEED NORMAL VALUES DURING REACTOR TRANSIENTS WHICH WOULD HAVE REQUIRED RELIEF VALVES TO OPEN.
IF SEVERITY IS SET AT 50%, NO ABNORMAL EFFECTS WILL BE OBSERVED.
REMOVAL OF THIS MALFUNCTION WILL RESTORE THE VALVE SETPOINT TO NORMAL.

CONTROL ROOM INDICATIONS:

REACTOR PRESSURE
SAFETY RELIEF VALVE INDICATING LIGHTS
SAFETY RELIEF VALVE TEMPERATURES

ANNUNCIATORS:

SAFETY/RELIEF VALVE OPEN	CRP 903 A3-2 (4-8)
SAFETY & BLOWDOWN VALVE LEAKAGE	CRP 903 A1 (6-2)

B-F -- SIMILAR TO MALF A.

AP01

REF:	P&ID	29119,SH 248
	CWD	488
	OP	337

AP02 APR/SAFETY RELIEF VALVE LEAKAGE

VARIABLE (100% = 800,000 LBM/HR)

A - SRV 1-MS-3A VALVE LEAKAGE

B - SRV 1-MS-3B VALVE LEAKAGE

C - SRV 1-MS-3C VALVE LEAKAGE

D - SRV 1-MS-3D VALVE LEAKAGE

E - SRV 1-MS-3E VALVE LEAKAGE

F - SRV 1-MS-3F VALVE LEAKAGE

TYPE: GENERIC, VARIABLE (100% = 800,000 LBM/HR)

CAUSE: WORN SEAT

PLANT STATUS: 100% POWER

EFFECTS: SAFETY RELIEF VALVE 1-MS-3A WILL LEAK ALLOWING STEAM TO FLOW INTO THE TORUS. THE TAILPIPE PRESSURE WILL INCREASE. THE TAILPIPE PRESSURE SWITCH WILL ACTUATE. SRV TAILPIPE TEMPERATURE WILL INCREASE, ACTUATING THE HIGH TEMPERATURE ANNUNCIATOR.

TORUS WATER TEMPERATURE IN THE VICINITY OF THE QUENCHER WILL INCREASE MORE RAPIDLY THAN OTHER AREAS OF THE TORUS.

TORUS WATER LEVEL WILL INCREASE.

REMOVAL OF THIS MALFUNCTION WILL STOP THE LEAKAGE.

CONTROL ROOM INDICATIONS:

SAFETY RELIEF VALVE TAILPIPE TEMPERATURE

TORUS WATER TEMPERATURES

TORUS WATER LEVEL

ANNUNCIATORS:

SAFETY/RELIEF VALVE OPEN	CRP 903 A3-2 (4-8)
SAFETY & BLOWDOWN VALVE LEAKAGE	CRP 903 A1 (6-2)
TORUS WATER HIGH TEMP	CRP 903 A1 (3-8)

AP02

B-F -- SIMILAR TO MALF A.

REF: P&ID 29119,SH 248
CWD 488
OP 337

AP03 APR ACTUATION FAILURE

A - APR 1-MS-3A ACTUATION FAILURE

C - APR 1-MS-3C ACTUATION FAILURE

D - APR 1-MS-3D ACTUATION FAILURE

F - APR 1-MS-3F ACTUATION FAILURE

TYPE: GENERIC

CAUSE: SIMULTANEOUS FAILURE OF CHANNEL A AND CHANNEL B 105 RELAY CONTACTS (103 RELAY FOR 1-MS- [illegible]D)

PLANT STATUS: 100% POWER

EFFECTS: WITH AN APR INITIATION SIGNAL PRESENT, 1-MS-3A WILL NOT ACTUATE. THIS WILL BE SEEN BY THE ABSENCE OF ANY TAILPIPE TEMPERATURE INCREASE. THE AMBER TAILPIPE PRESSURE LIGHT AND RED SOLENOID ENERGIZED LIGHT WILL NOT BE LIT.

WHILE THIS MALFUNCTION IS ACTIVE, THE VALVE WILL STILL FUNCTION NORMALLY IN RESPONSE TO REACTOR VESSEL HIGH PRESSURE OR THE MANUAL OPEN CONTROL SWITCH.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE RELAY CONTACTS TO NORMAL AND THE VALVE WILL RESPOND TO THE APR INITIATION SIGNAL, IF STILL PRESENT.

C-F -- SIMILAR TO MALF A.

CONTROL ROOM INDICATIONS:

SAFETY RELIEF VALVE TEMPERATURE
TORUS WATER TEMPERATURES

REF: P&ID 29119,SH 248
CWD 488,488A,489
OP 337

AP04 APR/SAFETY RELIEF VALVE STICKS

VARIABLE (0-100% VALVE POSITION)

A - SRV 1-MS-3A VALVE STICKS

B - SRV 1-MS-3B VALVE STICKS

C - SRV 1-MS-3C VALVE STICKS

D - SRV 1-MS-3D VALVE STICKS

E - SRV 1-MS-3E VALVE STICKS

F - SRV 1-MS-3F VALVE STICKS

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: MECHANICAL BINDING OF MAIN VALVE FOLLOWING OPERATION

PLANT STATUS: 100% POWER

EFFECTS: A -- RELIEF VALVE 1-MS-3A WILL POP OPEN NORMALLY THE FIRST TIME IT OPERATES WITH THIS MALFUNCTION ACTIVE. WHEN THE VALVE CLOSES, IT WILL STICK AT THE INSTRUCTOR SPECIFIED POSITION. THE SOLENOID INDICATING LIGHTS WILL SHOW THE VALVE CLOSED, BUT THE TAILPIPE PRESSURE MONITOR WILL STILL INDICATE FLOW. IF SEVERITY IS ZERO THE VALVE WILL CLOSE FULLY BUT WILL NOT OPEN AGAIN IF ACTUATED.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE VALVE TO OPERATE NORMALLY.

CONTROL ROOM INDICATIONS:

SAFETY RELIEF VALVE INDICATING LIGHTS

SAFETY RELIEF VALVE TAILPIPE TEMPERATURE

TORUS WATER TEMPERATURES

ANNUNCIATORS:

SAFETY/RELIEF VALVE OPEN	CRP 903 A3-2 (4-8)
SAFETY & BLOWDOWN VALVE LEAKAGE	CRP 903 A1 (6-2)

B-F -- SIMILAR TO MALF A.

AP04

REF:	P&ID	29119,SH 248
	CWD	488
	OP	337

CC01 TBCCW PUMP TRIP

A - TBCCW PUMP A TRIP (MOTOR SHORT)

B - TBCCW PUMP B TRIP (MOTOR SHORT)

C - TBCCW PUMP C TRIP (MOTOR SHORT)

TYPE: GENERIC

CAUSE: MOTOR SHORT CIRCUIT CAUSES ACTUATION OF INSTANTANEOUS OVERCURRENT TRIP DEVICE (50)

PLANT STATUS: 100% POWER

EFFECTS: TBCCW PUMP A WILL TRIP CAUSING THE TBCCW SYSTEM FLOW AND PRESSURE TO DECREASE. THE FLOW WILL BE REDUCED TO THE FOLLOWING COMPONENTS:

- REACTOR RECIRC MG LUBE OIL COOLERS
- VACUUM PRIMING PUMP COOLERS
- GENERATOR HYDROGEN COOLERS
- STATOR COOLANT SYSTEM COOLERS
- GENERATOR LEADS COOLER
- ALTERNATOR AIR COOLER
- MAIN TURBINE LUBE OIL COOLER

DEPENDING ON THE PLANT STATUS AND THE EQUIPMENT IN OPERATION, THE ASSOCIATED TEMPERATURES OF THE ABOVE COMPONENTS WILL INCREASE.

IF THE STANDBY TBCCW PUMP IS IMMEDIATELY STARTED, TBCCW SYSTEM FLOW, PRESSURE AND TEMPERATURES WILL RETURN TO NORMAL.

IF THE STANDBY PUMP IS NOT STARTED AND NO ACTION IS TAKEN TO REDUCE TBCCW SYSTEM FLOW, THE REMAINING PUMP WILL NOT BE CAPABLE OF SUPPLYING ENOUGH PRESSURE.

THIS WILL BE INDICATED BY ACTUATION OF THE PUMP LOW DISCHARGE PRESSURE ALARM.

ANNUNCIATORS:

TURB BLDG COOLING WATER PUMP A OVERLOAD OR TRIP	CRP 906 A2-1 (8-1)

CC01

TURB BLDG COOLING WATER DISCHARGE PRESS LOW	CRP 906 A2-1 (8-4)

IF ALL TBCCW SYSTEM FLOW IS LOST, THE MAJOR EFFECTS WILL BE:

- TURBINE RUNBACK DUE TO HIGH STATOR COOLANT TEMPERATURE
- TURBINE BEARING HIGH TEMPERATURE AND VIBRATION
- REACTOR RECIRC MG LUBE OIL HIGH TEMPERATURES
- GEN. HYDROGEN TEMP AND PRESSURE INCREASE

B -- SIMILAR TO MALF A EXCEPT TBCCW PUMP B IS THE AFFECTED COMPONENT.

C -- SIMILAR TO MALF A EXCEPT TBCCW PUMP C IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY 51A CONTACTS TO NORMAL.

REF: P&ID 26015

CWD'S SH 157, 158 & 159

OP 309A

CC02 TBCCW HX TUBE LEAK

VARIABLE (100% = 500 GPM)

A - TBCCW HX A TUBE LEAK

B - TBCCW HX B TUBE LEAK

C - TBCCW HX C TUBE LEAK

TYPE: GENERIC, VARIABLE (100% = 500 GPM)

CAUSE: TUBE FAILURE

PLANT STATUS: 100% POWER

EFFECTS: THIS MALFUNCTION WILL NORMALLY RESULT IN LEAKAGE OUT OF THE TBCCW SYSTEM INTO THE SERVICE WATER SYSTEM. IF THE TBCCW SYSTEM IS SHUTDOWN AND SERVICE WATER IS IN OPERATION THE LEAKAGE WILL BE INTO THE TBCCW SYSTEM.

ANY LEAKAGE INTO THE TBCCW SYSTEM WILL CAUSE THE TBCCW SURGE TANK TO FILL UP AND OVERFLOW TO THE REACTOR BUILDING FLOOR DRAIN SUMP B.

IF THE LEAKAGE OUT OF THE TBCCW SYSTEM IS EQUAL TO OR LESS THAN THE SURGE TANK MAKEUP FLOW RATE, THE TBCCW SYSTEM INVENTORY WILL BE MAINTAINED IF THE SURGE TANK MAKEUP VALVE IS OPENED USING REMOTE FUNCTION CCR04.

IF THE TBCCW SYSTEM INVENTORY CANNOT BE MAINTAINED, THE SURGE TANK LEVEL WILL DECREASE. THE RATE OF DECREASE WILL DEPEND UPON THE MALFUNCTION SEVERITY.

WHEN THE PUMP SUCTION PRESSURE DECREASES BELOW THE REQUIRED NPSH, THE TBCCW PUMPS WILL START TO CAVITATE. ADDITIONAL LOSS OF INVENTORY WILL RESULT IN A LOSS OF SYSTEM FLOW. THE EFFECTS OF LOSS OF SYSTEM FLOW ARE DESCRIBED IN MALFUNCTION CC01 EFFECTS.

IF THE AFFECTED HEAT EXCHANGER IS ISOLATED USING REMOTE FUNCTION CCR01, THE LEAKAGE WILL BE STOPPED.

ANNUNCIATORS:

TURB BLDG COOLING WATER SURGE TANK LEVEL HIGH	CRP 906 A1-2 (7-6)
TURB BLDG COOLING WATER SURGE TANK LEVEL LOW	CRP 906 A1-2 (8-6)
TURB BLDG COOLING WATER PUMPS DISCHARGE PRESS LOW	CRP 906 A2-1 (8-4)

CC02

B -- SIMILAR TO MALF A EXCEPT TBCCW HX B IS THE AFFECTED COMPONENT.

C -- SIMILAR TO MALF A EXCEPT TBCCW HX C IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL REPAIR THE LEAKING TUBES.

REF: P&ID 26015

CWD'S SH 157, 158 & 159

CC03 TBCCW HEADER LEAK

VARIABLE (50% = SURGE TANK MAKEUP FLOW RATE)

- TBCCW HEADER LEAK

TYPE: SPECIFIC, VARIABLE (50% = SURGE TANK MAKEUP FLOW RATE)

CAUSE: PIPE FAILURE AT THE DISCHARGE OF THE TBCCW HEAT EXCHANGERS

PLANT STATUS: 100% POWER

EFFECTS: THIS MALFUNCTION WILL RESULT IN LEAKAGE OF TBCCW SYSTEM WATER INTO THE TURBINE BUILDING. THE WATER WILL COLLECT IN TURBINE BUILDING FLOOR DRAIN SUMP A. WHEN THE SUMP LEVEL REACHES IT'S HIGH LEVEL SETPOINT, THE SUMP PUMP WILL START. IF THE SUMP LEVEL REACHES THE HIGH-HIGH LEVEL SETPOINT, A HIGH-HIGH LEVEL ALARM WILL ACTUATE.

THE EFFECTS OF LEAKAGE OUT OF THE TBCCW SYSTEM ARE DESCRIBED IN MALFUNCTION CC02 EFFECTS.

ANNUNCIATORS:

TURB BLDG FLR DRAIN SUMP A HI-HI	CRP 907 A1-1 (8-2)
TURB BLDG COOLING WATER SURGE TANK LEVEL HIGH	CRP 906 A1-2 (7-6)
TURB BLDG COOLING WATER SURGE TANK LEVEL LOW	CRP 906 A1-2 (8-6)

MALFUNCTION REMOVAL WILL STOP THE LEAK.

REF: P&ID 26015

P&ID 29138 SH 1

CWD 917

CC04 LOSS OF TBCCW TO GENERATOR HYDROGEN COOLERS

- LOSS OF TBCCW TO GEN H2 COOLER

TYPE: SPECIFIC

CAUSE: TEMPERATURE CONTROL VALVE 1-CC-15 FAILS CLOSE DUE TO INSTRUMENT AIR LEAK AT THE VALVE

PLANT STATUS: 100%

EFFECTS: WHEN THE TEMPERATURE CONTROL VALVE FAILS CLOSED, ALL TBCCW FLOW THRU THE GENERATOR HYDROGEN COOLERS WILL STOP. THIS WILL RESULT IN AN INCREASE IN GENERATOR TEMPERATURES. THE RATE OF TEMPERATURE INCREASE WILL BE A FUNCTION OF GENERATOR LOAD. THE INCREASED TEMPERATURES WILL BE INDICATED IN THE CONTROL ROOM ON TEMPERATURE RECORDERS AND BY ANNUNCIATORS. GENERATOR HYDROGEN PRESSURE WILL INCREASE AS A FUNCTION OF TEMPERATURE.

CONTROL PANEL INDICATIONS:

GENERATOR TEMPERATURES RECORDER

GENERATOR COLD GAS ROTOR-COLLECTOR

RECORDER

GENERATOR HYDROGEN PRESSURE

ANNUNCIATORS:

GEN HYDROGEN OR AIR FROM GEN FIELD COLLECT HI TEMP	CRP 907 A2-2 (5-5)
GEN FIELD HI TEMPERATURE/ UNDERVOLT	CRP 907 A2-2 (4-6)

REMOTE FUNCTION CCR05 MAY BE USED TO OPERATE THE GENERATOR HYDROGEN COOLER BYPASS VALVE (1-CC-17). OPERATION OF THE BYPASS VALVE WILL CONTROL GENERATOR TEMPERATURES WITH THE TEMPERATURE CONTROL VALVE FAILED CLOSE.

MALFUNCTION REMOVAL WILL RESTORE THE TEMPERATURE CONTROL VALVE TO NORMAL.

REF: P&ID 26015

GENERATOR TECH MANUAL

CC05 MAIN TURBINE LUBE OIL COOLER CONTROLLER FAILURE

VARIABLE (0-100% OF CONTROLLER OUTPUT)

- TURBINE L.O. COOLER CONTROLLER FAILURE

TYPE: SPECIFIC, VARIABLE (0-100% OF CONTROLLER OUTPUT)

CAUSE: FAILURE IN CONTROLLER AUTO OUTPUT

PLANT STATUS: 100%

EFFECTS: UPON MALFUNCTION INSERTION THE LUBE OIL COOLER CONTROLLER OUTPUT WILL GO TO THE VALUE CALLED FOR BY THE MALFUNCTION SEVERITY. THE TEMPERATURE CONTROL VALVE WILL BE POSITIONED ACCORDINGLY, RESULTING IN AN INCREASE OR DECREASE IN LUBE OIL OUTLET TEMPERATURE. THE CHANGE IN LUBE OIL OUTLET TEMPERATURE WILL CAUSE A CHANGE IN TURBINE BEARING TEMPERATURES AND AN INCREASE IN TURBINE BEARING VIBRATION.

IF THIS MALFUNCTION RESULTS IN A DECREASE IN TBCCW FLOW, THE TURB L.O. TEMPERATURE CONTROL VALVE BYPASS VALVE 1-CC-23 CAN BE OPERATED, USING REMOTE FUNCTION CCR06, TO CONTROL LUBE OIL TEMPERATURE.

CONTROL PANEL INDICATIONS:

MAIN TURBINE LUBE OIL TEMPERATURES

MAIN TURBINE BEARING METAL TEMPERATURES

MAIN TURBINE BEARING VIBRATION

ANNUNCIATORS:

TURB OIL COOLER OR BRG DRN OIL TEMP HI	CRP 907 A1-1 (5-1)
TURB BEARING HI TEMP	CRP 907 A1 (5-2)
TURB VIBRATION EXCESSIVE	CRP 907 A1-1 (2-3)

MALFUNCTION REMOVAL WILL RETURN THE CONTROLLER TO NORMAL.

REF: P&ID 26015

TURBINE MANUAL

CC06 LOSS OF TBCCW PUMP BREAKER CONTROL POWER

A - TBCCW PUMP A LOSS OF CONTROL POWER

B - TBCCW PUMP B LOSS OF CONTROL POWER

C - TBCCW PUMP C LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES IN CONTROL CIRCUIT

PLANT STATUS: 100% POWER

EFFECTS: WHEN THIS MALFUNCTION IS INSERTED BOTH FUSES ON THE POSITIVE SIDE OF THE CONTROL CIRCUIT WILL BLOW.

WITH THE FUSES BLOWN, THE PUMP STOP/RUN INDICATION WILL EXTINGUISH AND THE PUMP CANNOT BE STARTED IF IT IS OFF AND CANNOT BE SHUT OFF IF IT IS RUNNING. ALSO THE PUMP

WILL NOT TRIP IF MALFUNCTION CC01 IS INSERTED, BUT THE BUS WILL SEE THE OVERCURREN CONDITION AND TRIP.

ANNUNCIATORS:

NONE

SIMILAR TO MALF A EXCEPT TBCCW PUMP B IS THE AFFECTED COMPONENT.

SIMILAR TO MALF A EXCEPT TBCCW PUMP C IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL REPLACE THE BLOWN FUSES.

REF: CWD'S SH 157, 158 & 159

CC07 STATOR COOLING WATER LOW FLOW

- STATOR COOLING FLOW BLOCKAGE

TYPE: SPECIFIC

CAUSE: GENERATOR INLET STRAINER BLOCKAGE RESULTS IN 80% REDUCTION IN STATOR COOLING FLOW

PLANT STATUS: 100% POWER

EFFECTS: STATOR COOLING FLOW INTO THE GENERATOR WILL DECREASE TO APPROX 65 GPM, THE LOW FLOW WILL ACTUATE THE COMMON STATOR COOLING TROUBLE ALARM. THE REDUCTION IN STATOR COOLING FLOW WILL CAUSE THE STATOR COOLANT OUTLET TEMPERATURE TO INCREASE. WHEN IT REACHES 194 DEG F A HIGH TEMPERATURE ALARM WILL ACTUATE AND WHEN IT REACHES 205 DEG F (95 DEG C) A TURBINE RUNBACK WILL OCCUR. AS THE TURBINE LOAD DECREASES, THE TURBINE BYPASS VALVES WILL OPEN TO MAINTAIN STEAM HEADER PRESSURE. THE TURBINE WILL RUNBACK UNTIL THE TURBINE LOAD IS REDUCED TO LESS THAN 25%. IF THIS IS NOT ACCOMPLISHED WITHIN 3 MINUTES THE MAIN TURBINE WILL TRIP. IF, DURING THE RUNBACK, THE RUNBACK SIGNAL RESETS, THE TURBINE WILL STOP RUNNING BACK AND TURBINE LOAD WILL REMAIN AT ITS PRESENT VALUE.

CONTROL PANEL INDICATIONS:

STATOR COOLANT TEMPERATURES

ANNUNCIATORS:

GENERATOR STATOR COOLING TROUBLE	CRP 907 A2-1 (5-3)
GENERATOR STATOR COOLANT TEMPERATURE HIGH	CRP 907 A2-1 (5-6)
GENERATOR LOSS OF STATOR COOLING LOAD RUNBACK	CRP 907 A2-1 (5-7)

MALFUNCTION REMOVAL WILL RESTORE THE STATOR COOLING FLOW TO NORMAL.

GENERATOR TECH MANUAL

REF: OP 314

CWD'S 60 & 216

CC08 STATOR COOLING PUMP TRIP

A - STATOR COOLING PUMP A TRIP

B - STATOR COOLING PUMP B TRIP

TYPE: GENERIC

CAUSE: ACTUATION OF THE DEVICE 49 THERMAL OVERLOAD

PLANT STATUS: 100% POWER

EFFECTS: MALFUNCTION A EFFECTS ARE WRITTEN WITH PUMP A IN RUN AND PUMP B IN RESERVE.

WHEN THE 49 THERMAL OVERLOAD ACTUATES, CONTROL POWER TO THE PUMP WILL BE LOST AND THE PUMP WILL STOP AND BOTH INDICATING LIGHTS WILL GO OUT. THIS WILL CAUSE THE STATOR COOLANT PRESSURE TO DECREASE.

THE SYSTEM LOW PRESSURE WILL ACTUATE THE COMMON STATOR COOLING TROUBLE ALARM AND AUTOMATICALLY START PUMP B.

WITH PUMP B RUNNING THE SYSTEM PRESSURE WILL RETURN TO NORMAL. THE COMMON STATOR COOLING TROUBLE ALARM WILL NOT RESET DUE TO THE RESERVE PUMP RUNNING. THE TURBINE

LOSS OF COOLING LOAD RUNBACK ALARM WILL ALARM BUT WILL IMMEDIATELY CLEAR WHEN THE B PUMP STARTS.

IF PUMP B DOES NOT START, STATOR COOLANT PRESSURE WILL CONTINUE TO DECREASE AND ACTUATE A TURBINE RUNBACK AT 13 PSIG. THE EFFECTS OF THE TURBINE RUNBACK ARE DESCRIBED IN MALFUNCTION CC07 EFFECTS.

ANNUNCIATORS:

GENERATOR STATOR COOLING TROUBLE	CRP 907 A2-1 (5-3)
GENERATOR STATOR COOLANT TEMPERATURE HIGH	CRP 907 A2-2 (5-6)
GENERATOR LOSS OF STATOR COOLING LOAD RUNBACK	CRP 907 A2-2 (5-7)

B -- SIMILAR TO MALFUNCTION A EXCEPT THAT STATOR COOLANT PUMP B IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL AND USE OF REMOTE FUNCTION EDR17, OVERCURRENT RESET, WILL RESET THE 49 THERMAL OVERLOAD AND RESTORE CONTROL POWER TO THE PUMP.

CC08

GENERATOR TECH MANUAL

REF: OP 314

CWD'S 60, 216, 218 & 219

CC09 GENERATOR LEADS FAN FAILURE

CAUSE: BROKEN FAN BELTS

PLANT STATUS: 100% POWER

EFFECTS: THE GENERATOR LEADS FAN IS DRIVEN BY A BELT WHICH CAN BE CONNECTED TO ONLY ONE OF THE TWO FAN MOTORS. THE FAN MOTORS AND BELT CONNECTION IS CONTROLLED BY REMOTE FUNCTIONS CCR12, 13, AND 14.

MALFUNCTION A EFFECTS ARE WRITTEN WITH THE BELT CONNECTED TO FAN MOTOR A AND WITH FAN MOTOR A RUNNING. WHEN THE BELT BREAKS THE FAN WILL STOP AND THE MOTOR WILL CONTINUE TO RUN. WITH NO COOL AIR FLOW THRU THE GENERATOR LEADS BUS DUCT, THE GENERATOR LEADS TEMPERATURES WILL INCREASE. WHEN THE GENERATOR LEADS TEMPERATURES REACH 225 DEG F, A HIGH TEMPERATURE ALARM WILL ACTUATE. AT THIS TIME, ACTION SHOULD BE TAKEN TO REDUCE GENERATOR LOAD AS PER OP 340 SECTION 6.8.4. IF NO ACTION IS TAKEN, NO EFFECTS WILL BE SEEN OTHER THAN THE TEMPERATURES INCREASING TO HIGHER THAN NORMAL STABLE VALUES.

CONTROL PANEL INDICATIONS:

MAIN LEADS TEMPERATURES

ANNUNCIATORS:

GENERATOR LEADS AIR INLET HUMIDITY HIGH/LOW FLOW	CRP 907 A2-1 (6-3)
GENERATOR LEADS OR TRANSF TEMPERATURE HIGH	CRP 907 A2-1 (6-1)

REF: OP 340

CWD'S 239 & 240

CH01 DRYWELL COOLING UNIT FAILURE

A - DW COOLER HVH-18 BELT FAILURE

B - DW COOLER HVH-19 BELT FAILURE

C - DW COOLER HVH-20 BELT FAILURE

D - DW COOLER HVH-21 BELT FAILURE

E - DW COOLER HVH-22 BELT FAILURE

F - DW COOLER HVH-26 BELT FAILURE

G - DW COOLER HVH-27 BELT FAILURE

H - DW COOLER HVH-28 BELT FAILURE

TYPE: GENERIC

CAUSE: DRIVE BELT BREAKAGE

PLANT STATUS: 100% POWER

EFFECTS: THIS MALFUNCTION WILL CAUSE THE AIR FLOW THROUGH THE DRYWELL COOLING UNIT TO STOP. THE DIFFERENTIAL TEMPERATURE ACROSS HVH 18 WILL DECREASE AS THE OUTLET DUCT TEMPERATURE EQUALIZES WITH DRYWELL AIR TEMPERATURE. DRYWELL TEMPERATURE AND PRESSURE WILL INCREASE.

CONTROL ROOM INDICATIONS:

DRYWELL TEMPERATURE

DRYWELL PRESSURE

ANNUNCIATORS:

HV TROUBLE CRP 906 A1-2 (9-5)

B-H -- SIMILAR TO MALF A EXCEPT THE AFFECTED COMPONENTS WILL BE HVH 19-22 AND 26-28.

REF: P&ID 24014

OP 311

CR01 FUEL CLADDING FAILURE

VARIABLE (100%=100,000 UC/SEC)

- FUEL CLADDING FAILURE

TYPE: SPECIFIC, VARIABLE(100%=100,000 UC/SEC)

CAUSE: EQUILIBRIUM FISSION PRODUCT RELEASE THROUGH RANDOMLY DISTRIBUTED PINHOLE FUEL CLADDING PERFORATIONS

PLANT STATUS: ANY

EFFECTS: FISSION PRODUCTS WILL BE RELEASED FROM THE CORE INTO THE RECIRCULATION SYSTEM AT THE INSTRUCTOR

SPECIFIED RATE REGARDLESS OF CORE POWER OR FLOW. THE PRINCIPAL SOURCE OF ACTIVITY FROM THIS MALFUNCTION WILL BE FISSION GASES, THEREFORE MOST OF THE ACTIVITY WILL LEAVE THE REACTOR VESSEL WITH THE FLOW OF STEAM.

SOME PERCENTAGE OF THE ACTIVITY WILL BE DUE TO NON-VOLATILE FISSION PRODUCTS WHICH WILL REMAIN IN THE RECIRCULATION SYSTEM. GASEOUS ACTIVITY WILL PROPAGATE THROUGH THE MAIN CONDENSER TO THE SJAE AND OFFGAS SYSTEM TO THE STACK. IT WILL ALSO PROPAGATE THROUGH ANY FLOW PATH FOR STEAM, EITHER NORMAL OR DUE TO MALFUNCTIONS. NONVOLATILE ACTIVITY WILL ACCUMULATE IN THE RECIRCULATION SYSTEM. IT WILL PROPAGATE THROUGH ANY LIQUID FLOWS TO OTHER SYSTEMS OR THROUGH MALFUNCTIONS WHICH CAUSE LIQUID LEAKAGE. THIS ACTIVITY WILL BE REMOVED THROUGH NORMAL FUNCTIONING OF THE RWCU SYSTEM. THE PROPAGATION OF ACTIVITY WILL BE SEEN ON APPROPRIATE AREA AND PROCESS MONITORS IN THE CONTROL ROOM.

THE EFFECTS OF FISSION PRODUCT DECAY ARE NOT EXPECTED TO BE VISIBLE ON FISSION PRODUCT CONCENTRATION SINCE MOST OF THEM ARE LONG LIVED IN COMPARISON WITH THE LENGTH OF A TRAINING SESSION ON THE SIMULATOR.

THE MALFUNCTION SEVERITY WHICH WILL CAUSE A REACTOR SCRAM AND ISOLATION IS DEPENDENT ON THE POWER LEVEL, STEAM FLOW RATE AND LENGTH OF TIME THE MALFUNCTION IS ACTIVE.

CONTROL ROOM INDICATIONS:

MAIN STEAM LINE RADIATION LEVELS

OFFGAS RADIATION LEVELS

STACK RADIATION LEVELS

CR01

RECIRC AREA RADIATION LEVELS

RWCU AREA RADIATION LEVELS

REF: OP 508

GE NEDO-24810 (STATION NUCLEAR ENGINEERING), SEC 12.3

TECH SPEC SEC. 1.1/2.1

FSAR SEC 9.2

CR02 INCREASED CONTROL ROD WORTH

XXYY - INCREASED CONTROL ROD WORTH

SPECIFY ROD NUMBER

VARIABLE (100% = 5 TIMES NORMAL ROD WORTH)

TYPE: GENERIC

CAUSE: THIS MALFUNCTION IS NOT ATTRIBUTED TO A SPECIFIC CAUSE. IT IS INTENDED TO PRODUCE THE EFFECTS OBSERVED UNDER CERTAIN ABNORMAL CIRCUMSTANCES OF ROD PATTERN, XENON DISTRIBUTION, AND POWER HISTORY.

PLANT STATUS: STARTUP

EFFECTS: THE INCREMENTAL WORTH OF THE SPECIFIED CONTROL ROD WILL INCREASE. THE CURRENT REACTIVITY OF THAT ROD WILL NOT CHANGE, AND THERE WILL BE NO EFFECTS UNTIL THAT ROD IS MOVED FROM ITS PRESENT POSITION.

IF THE ROD IS WITHDRAWN FROM ITS PRESENT POSITION IT WILL ADD MORE REACTIVITY THAN IT WOULD NORMALLY. IF THIS MOTION ACHIEVES CRITICALLITY, IT MAY RESULT IN A SHORTER PERIOD, WITH A ONE-NOTCH WITHDRAWAL PRODUCING A PERIOD OF 10-20 SECONDS. THE ROD MAY BE INSERTED TO ITS ORIGINAL POSITION TO TURN POWER.

IF THE ROD IS INSERTED FROM ITS PRESENT POSITION, IT WILL ADD MORE NEGATIVE REACTIVITY THAN IT WOULD NORMALLY.

IF THIS MALFUNCTION IS ACTIVATED ON RODS WHICH ARE TO BE FULLY WITHDRAWN EARLY IN THE STARTUP, CRITICALITY WILL BE ACHIEVED EARLIER IN THE PULL SEQUENCE THAN NORMAL.

REF: CYCLE DATA REPORT

CS01 CORE SPRAY PUMP TRIP

A - CS PUMP A TRIP

B - CS PUMP B TRIP

TYPE: GENERIC

CAUSE: MOTOR SHORT CIRUIT CAUSES ACTUATION OF INSTANTANEOUS OVERCURRENT TRIP DEVICE (50)

PLANT STATUS: ANY

EFFECTS: IF RUNNING, THE PUMP WILL TRIP. IF NOT RUNNING, OR IF RESTARTED, THE PUMP WILL TRIP AS SOON AS THE BREAKER CLOSES. THE PUMP TRIPPED ANNUNCIATOR WILL ACTUATE, THEN CLEAR IMMEDIATELY. IF THE PUMP STARTED AS THE RESULT OF AN AUTOMATIC CORE SPRAY INITIATION, THE RUNNING-ON-AUTO ANNUNCIATOR WILL ACTUATE, THEN IMMEDIATELY CLEAR.

REMOVAL OF THIS MALFUNCTION WILL CORRECT THE FAULT AND ALLOW NORMAL OPERATION OF THE PUMP.

CONTROL ROOM INDICATIONS:

PUMP STATUS LIGHTS

BUS 14F CURRENT SPIKE

PUMP DISCHARGE PRESSURE/FLOW

ANNUNCIATORS:

CORE SPRAY PUMP A OL OR TRIPPED	CRP 903 A1 (6-3)
CORE SPRAY PUMP A RUNNING ON AUTO	CRP 903 A1 (7-3)

B -- SIMILAR TO MALF A EXCEPT CURRENT SPIKE IS ON 14E

REF: P&ID 26008

CWD 741

OP 336

CS02 CORE SPRAY PUMP FAILS TO AUTO START

A - CS PUMP A FAIL TO AUTO START

B - CS PUMP B FAIL TO AUTO START

TYPE: GENERIC

CAUSE: AUTO START RELAY 932/1930-115A OR B, CONTACT 1-2 FAILS CLOSE

PLANT STATUS: ANY, WITH CORE SPRAY INITIATION SIGNAL PRESENT
THE AUTOMATIC FUNCTIONS OF THE CORE SPRAY SYSTEM WILL ALL OCCUR NORMALLY EXCEPT THE PUMP WHICH WILL NOT AUTOMATICALLY START. THE PUMP MAY BE MANUALLY STARTED, AT WHICH TIME THE RUNNING-ON-AUTO ANNUNCIATOR WILL ACTUATE.

EFFECTS: REMOVAL OF THIS MALFUNCTION WILL ALLOW THE PUMP TO START AUTOMATICALLY IF NOT ALREADY STARTED. IF THE PUMP IS ALREADY RUNNING, NO EFFECTS WILL BE SEEN FROM EITHER ACTIVATION OR REMOVAL OF THIS MALFUNCTION.

CONTROL ROOM INDICATIONS:

PUMP BREAKER STATUS

PUMP DISCHARGE PRESSURE/FLOW

ANNUNCIATORS:

CORE SPRAY PUMP A RUNNING-ON-AUTO	CRP 903 A1 (7-3)

B -- SIMILAR TO MALF A.

REF: P&ID 26008
CWD 741
OP 336

CS03 CORE SPRAY INJECTION VALVE BINDS

VARIABLE (0-100% VALVE POSITION)

A - CS INJ VALVE 1-CS-5A BINDS

B - CS INJ VALVE 1-CS-5B BINDS

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: MECHANICAL BINDING IN VALVE OPERATOR TRIPS MOTOR DEVICE (49) ON OVERCURRENT

PLANT STATUS: ANY

EFFECTS: WHEN VALVE 1-CS-5A IS BEING OPERATED AND PASSES THROUGH THE INSTRUCTOR SPECIFIED POSITION, THE VALVE MOTOR SUPPLY BREAKER WILL NOT TRIP. THE VALVE WILL REMAIN AT THAT POSITION AND THE VALVE MOTOR OVERLOAD ANNUNCIATOR WILL ACTUATE. THE INDICATING LIGHTS WILL NOT GO OUT.

REMOVAL OF THIS MALFUNCTION AND USE OF REMOTE FUNCTION EDR 17, OVERCURRENT RESET, WILL RESET DEVICE (49). IF

AN OPEN SIGNAL IS STILL PRESENT, THE VALVE WILL OPEN.

IF NO SIGNAL IS PRESENT, THE VALVE WILL REMAIN IN ITS PRESENT POSITION UNTIL ORDERED EITHER OPEN OR CLOSED.

CONTROL ROOM INDICATIONS:

VALVE POSITION INDICATING LIGHTS

PUMP DISCHARGE PRESSURE/FLOW

ANNUNCIATORS:

CORE SPRAY SYS I VALVES MOTOR OVERLOAD	CRP 903 A-1 (8-3)

B -- SIMILAR TO MALF A.

REF: P&ID 26008
CWD 746
OP 336

CS04 LOSS OF CORE SPRAY PUMP BREAKER CONTROL POWER

A - CS PUMP A LOSS OF CONTROL POWER

B - CS PUMP B LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES

PLANT STATUS: ANY

EFFECTS: LOSS OF CONTROL POWER WILL CAUSE BOTH BREAKER POSITION LIGHTS TO GO OUT. IF STOPPED, THE PUMP WILL NOT RESPOND TO ANY START SIGNAL. IF RUNNING, THE PUMP WILL NOT TRIP FOR ANY REASON. IF MALFUNCTION CS01 IS ACTIVATED AT THE SAME TIME, THE OVERCURRENT CONDITION WILL CAUSE BUS 14F TO TRIP.

REMOVAL OF THIS MALFUNCTION WILL RESTORE CONTROL POWER AND ALLOW THE PUMP TO RESPOND NORMALLY.

CONTROL ROOM INDICATIONS:

PUMP BREAKER POSITION INDICATING LIGHTS

PUMP DISCHARGE PRESSURE/FLOW

B -- SIMILAR TO MALF A.

REF: P&ID 26008
CWD 741
OP 336

CS05 CORE SPRAY PIPE BREAK BETWEEN RPV AND SHROUD

VARIABLE (100% = COMPLETE PIPE BREAK)

A - CS A PIPE BREAK INSIDE RPV

B - CS B PIPE BREAK INSIDE RPV

TYPE: GENERIC, VARIABLE (100% = COMPLETE PIPE BREAK)

CAUSE: PIPE FAILURE

PLANT STATUS: 100% POWER

EFFECTS: DIFFERENTIAL PRESSURE SWITCH 2251/1495A MONITORS PRESSURE IN THE CORE SPRAY LINE AND COMPARES IT TO ABOVE-CORE-PLATE PRESSURE. THE DPIS IS CALIBRATED TO READ 4 PSID AT 100% POWER DURING NORMAL OPERATION. WITH ANY SEVERITY PIPE BREAK, PRESSURE IN THE CORE SPRAY PIPING WILL DECREASE TO PRESSURE OUTSIDE THE SHROUD. ALTHOUGH THIS CAUSES ACTUAL DIFFERENTIAL PRESSURE TO INCREASE, INDICATED DIFFERENTIAL PRESSURE DECREASES BECAUSE THE DPIS IS INSTALLED IN REVERSE OF NORMAL. IF THE DIFFERENTIAL PRESSURE DECREASES TO 2 PSID THE HIGH DP ANNUNCIATOR WILL ACTUATE. NO OTHER EFFECTS WILL BE SEEN UNLESS THE CORE SPRAY SYSTEM IS INJECTING WATER INTO THE VESSEL.

IF CORE SPRAY IS IN PROGRESS, THE FLOW OF WATER WILL BE DIVIDED BETWEEN THE DOWNCOMER AND THE CORE APPROXIMATELY IN PROPORTION TO MALFUNCTION SEVERITY. AT 100% SEVERITY, NO CORE SPRAY WILL REACH THE CORE DIRECTLY; IT WILL ALL GO INTO THE DOWNCOMER. THE EFFECTS OF THIS MAY NOT BE DIRECTLY OBSERVED DEPENDING UPON LOCATION OF PRIMARY SYSTEM RUPTURE, IF ANY, AND WHAT OTHER SYSTEMS ARE INJECTING INTO THE VESSEL.

REMOVAL OF THIS MALFUNCTION WILL RESTORE HEADER INTEGRITY.

ANNUNCIATORS:

CORE SPRAY HEADER A HI DIF PRESSURE	CRP 903 A1 (4-3)

B -- SIMILAR TO MALF A.

REF: P&ID 26008
CWD 744
OP 336

CU01 MAIN RWCU PUMP TRIP

A - RWCU RECIRC PUMP A TRIP

B - RWCU RECIRC PUMP B TRIP

TYPE: GENERIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: 100% POWER

EFFECTS: IF THE PUMP IS RUNNING, OR WHEN IT IS STARTED, THE INSTANTANEOUS OVERCURRENT TRIP DEVICE (50) WILL ACTUATE. THE INDICATING LIGHTS WILL CONTINUOUSLY SHOW THE BREAKER STATUS. THE BREAKER WILL TRIP, THE P WILL STOP, AND THE PUMP TRIPPED ANNUNCIATOR WILL A' ATE, THEN CLEAR .25 SEC LATER.

AS FLOW THROUGH THE RWCU SYSTEM DECREASES BELOW 275 GPM, THE LOW FLOW ANNUNCIATOR WILL ACTUATE.

ATTEMPTING TO RESTART THE PUMP WILL CAUSE THE BREAKER TO CLOSE AND TRIP IMMEDIATELY.

REMOVAL OF THE MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE PUMP.

CONTROL ROOM INDICATIONS:

RWCU SYSTEM FLOW

RWCU SYSTEM TEMPERATURES

ANNUNCIATORS:

CLEANUP PUMP "A" TRIPPED BY OVLD	CRP 904 A2 (1-3)
CLEANUP SYSTEM LO FLOW	CRP 904 A2 (2-2)

B -- SIMILAR TO MALF A.

REF: P&ID 29130
CWD 680
OP 303

CU02 RWCU AUXILIARY PUMP TRIP

- RWCU AUX PUMP TRIP

TYPE: SPECIFIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: STARTUP, LESS THAN 140 PSIG

EFFECTS: IF THE PUMP IS RUNNING, OR WHEN IT IS STARTED, THE BREAKER WILL TRIP DUE TO OVERCURRENT. THE PUMP WILL STOP AND THE PUMP TRIPPED ANNUNCIATOR WILL ACTUATE. AS FLOW THROUGH THE RWCU SYSTEM DECREASES BELOW 275 GPM, THE LOW FLOW ANNUNCIATOR WILL ACTUATE.

ATTEMPTING TO RESTART THE PUMP WILL NOT CAUSE THE BREAKER TO CYCLE.

REMOVAL OF THE MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE PUMP.

CONTROL ROOM INDICATIONS:

RWCU SYSTEM FLOWS

RWCU SYSTEM TEMPERATURES

ANNUNCIATORS:

CLEANUP AUX PUMP TRIPPED BY OVLD	CRP 904 A2 (8-3)
CLEANUP SYSTEM LO FLOW	CRP 904 A2 (2-2)

REF:
P&ID 29130
CWD 682
OP 303

CU03 RWCU DEMIN RESIN DEPLETION

VARIABLE (100% = COMPLETE DEPLETION)

A - RWCU DEMIN A DEPLETION

B - RWCU DEMIN B DEPLETION

C - RWCU DEMIN C DEPLETION

TYPE: GENERIC, VARIABLE (100% = COMPLETE DEPLETION)

CAUSE: OLD RESIN

PLANT STATUS: 100% POWER

EFFECTS: THE DEMINERALIZER RESIN WILL NO LONGER PERFORM EFFICIENT ION EXCHANGE. AT 100% SEVERITY, EFFLUENT CONDUCTIVITY WILL INCREASE TO INFLUENT CONDUCTIVITY. AS EFFLUENT CONDUCTIVITY INCREASES ABOVE 0.1 MICROMHOS/SQ CM, THE CLEANUP HIGH CONDUCTIVITY ANNUNCIATOR WILL ACTUATE.

REACTOR WATER CONDUCTIVITY WILL BEGIN INCREASING DUE TO THE BUILDUP OF NORMAL CORROSION PRODUCTS AND WILL STABILIZE AT A HIGHER VALUE WHICH IS A FUNCTION OF THE OVERALL EFFICIENCY OF THE CLEANUP SYSTEM. IF INFLUENT CONDUCTIVITY EXCEEDS 0.5 MICROMHOS/SQ CM, THE REACTOR WATER HI CONDUCTIVITY ANNUNCIATOR WILL ACTUATE. AT 2.0 MICROMHOS/SQ CM, THE REACTOR WATER HI HI CONDUCTIVITY ANNUNCIATOR WILL ACTUATE.

REMOVAL OF THIS MALFUNCTION AND REMOVAL OF THE DEMIN FROM SERVICE, USING REMOTE FUNCTION CUR04, WILL RESTORE THE RESIN TO ITS NORMAL ION EXCHANGE EFFICIENCY.

CONTROL ROOM INDICATION:

RWCU SYSTEM CONDUCTIVITY

ANNUNCIATORS:

CLEANUP SYSTEM HI CONDUCTIVITY	CRP 904 A2 (5-1)
REACTOR WATER CONDUCTIVITY HIGH HIGH	CRP 904 A2 (9-4)

B-C -- SIMILAR TO MALF A.

REF: P&ID 29130
CWD 614
OP 303

CU04 RWCU SYSTEM LEAK UPSTREAM OF REGEN HX

VARIABLE (100% = 500 GPM)

- RWCU INFLUENT LEAK AT INLET TO REGEN HX

TYPE: SPECIFIC, VARIABLE (100% = 500 GPM)

CAUSE: PIPE BREAK AT INFLUENT INLET TO REGEN HX

PLANT STATUS: 100% POWER

EFFECTS: THE LEAKING WATER WILL FLASH TO STEAM AS IT IS REDUCED TO ATMOSPHERIC PRESSURE. THE TEMPERATURE IN THE RWCU HX ROOM WILL INCREASE RAPIDLY. AS THE ROOM TEMPERATURE EXCEEDS 115 DEG, THE STEAM LEAK ANNUNCIATOR WILL ACTUATE. THE ROOM TEMPERATURE MAY BE OBSERVED ON PANEL 921. INCREASED HEAT LOAD AND PROPAGATION OF ACTIVITY WILL BE SEEN IN REACTOR BUILDING HVAC. THE LEAKAGE WILL APPEAR IN THE REACTOR BUILDING FLOOR DRAIN SUMP.

THE LEAK RATE IS SMALL COMPARED WITH THE INLET PIPE SIZE AND WILL NOT VISIBLY AFFECT THE RWCU INLET PRESSURE. IF THE INLET FROM THE REACTOR VESSEL IS ISOLATED, THE RWCU SYSTEM WILL DEPRESSURIZE RAPIDLY. NO ISOLATION IS EXPECTED TO OCCUR DIRECTLY FROM THIS MALFUNCTION.

REMOVAL OF THIS MALFUNCTION WILL STOP THE LEAK.

CONTROL ROOM INDICATIONS:

RWCU REGEN HX ROOM TEMPERATURE

REACTOR BUILDING FLOOR DRAIN SUMP LEVEL

ANNUNCIATORS:

STEAM LEAK AREAS HI TEMP	CRP 903 A2 (9-2)

REF: P&ID 29130
CWD 614
OP 303

CU05 RWCU NON-REGEN HX TUBE LEAK

VARIABLE (100% = 100 GPM)

- RWCU NRHX TUBE LEAK

TYPE: SPECIFIC, VARIABLE (100% = 100 GPM)

CAUSE: TUBE EROSION AT INLET TUBE SHEET

PLANT STATUS: 100% POWER

EFFECTS: WATER WILL FLOW FROM THE RWCU INLET INTO THE RBCCW SYSTEM.

LEVEL IN THE RBCCW EXPANSION TANK WILL INCREASE, ACTUATING THE HIGH LEVEL ANNUNCIATOR AND THEN OVERFLOWING TO THE REACTOR BUILDING FLOOR DRAIN SUMP B. THE LEAK WILL CAUSE INCREASED ACTIVITY IN THE RBCCW SYSTEM.

THE LEAK WILL ALSO CAUSE MORE INFLUENT FLOW THROUGH THE REGENERATIVE HEAT EXCHANGER WHICH WILL RESULT IN HIGHER INFLUENT FLOW THROUGH THE REGENERATIVE HX WHICH WILL RESULT IN HIGHER INLET TEMPERATURE TO THE NON-REGEN HX.

IF THE SYSTEM IS ISOLATED, THE PIPING UPSTREAM OF THE FILTER WILL THEN DEPRESSURIZE RAPIDLY TO RBCCW SYSTEM PRESSURE.

REMOVAL OF THIS MALFUNCTION WILL STOP THE LEAK.

CONTROL ROOM INDICATIONS:

RWCU SYSTEM TEMPERATURES

RBCCW SYSTEM TEMPERATURES

RBCCW ACTIVITY
REACTOR BUILDING FLOOR DRAIN SUMP B LEVEL

ANNUNCIATORS:

REACTOR BUILDING COOLING WATER SURGE TANK LEVEL HIGH	CRP 906 (A2-1) (9-3)
CLEANUP NON REGEN HX OUT HI TEMPERATURE	CRP 904 (A2) (8-1)
CLEANUP SYSTEM LO FLOW	CRP 904 (A2) (2-2)

CLEANUP PUMPS DISCH
LO PRESSURE

CRP 904 (A2)
(7-2)

REF: P&ID 29130
CWD 614
OP 303

CU06 RWCU PCV CONTROLLER FAILURE

VARIABLE (0-100% VALVE POSITION)

- RWCU PCV 1-CU-10 CONTROLLER FALURE

TYPE: SPECIFIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: E/P CONVERTER FAILURE

PLANT STATUS: 100% POWER

EFFECTS: PRESSURE CONTROL VALVE 1-CU-10 WILL GO TO THE INSTRUCTOR SPECIFIED POSITION.

IF THE VALVE OPENS FROM ITS NORMAL POSITION, RWCU SYSTEM PRESSURE WILL INCREASE AS SEEN ON THE PRESSURE CONTROLLER AND PUMP DISCHARGE PRESSURE. SYSTEM FLOW WILL INCREASE

WHEN PRESSURE EXCEEDS 140 PSIG, THE RWCU SYSTEM WILL ISOLATE. THE PUMPS WILL TRIP AS THE ISOLATION VALVES CLOSE.

IF THE VALVE CLOSES FROM ITS NORMAL POSITION, RWCU SYSTEM PRESSURE WILL DECREASE. SYSTEM FLOW WILL DECREASE. SINCE THE FLOW CONTROLLER IS NORMALLY IN MANUAL, PUMP SUCTION PRESSURE MAY DECREASE BELOW 10 PSIG CAUSING THE PUMPS TO TRIP AND THE LOW SUCTION PRESSURE ANNUNCIATOR TO ACTUATE. PRESSURE WILL THEN INCREASE AND THE SYSTEM WILL ISOLATE AS ABOVE.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE VALVE TO RETURN TO POSITION DEMANDED BY THE PRESSURE CONTROLLER OUTPUT.

CONTROL ROOM INDICATIONS:

RWCU SYSTEM FLOW

RWCU SYSTEM TEMPERATURES

RWCU SYSTEM PRESSURE

ANNUNCIATORS:

CLEANUP PRESS REG STATION OUT HI PRESSURE	CRP 904 A2 (9-1)
CLEANUP PUMP SUCTION PRESS LOW	CRP 904 A2 (5-2)

CU06

REF:	P&ID	29130
	CWD	614
	OP	303

CU07 RWCU REJECT FLOW CONTROLLER FAILURE

VARIABLE (0-100% VALVE POSITION)

- RWCU REJECT VALVE CONTROLLER FAILURE

TYPE: SPECIFIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: E/P CONVERTER FAILURE

PLANT STATUS: 100% POWER

EFFECTS: THE VALVE WILL GO TO THE INSTRUCTOR SPECIFIED POSITION. REJECT FLOW WILL BE INDICATED. THE RWCU SYSTEM MAY ISOLATE DUE TO HIGH TEMPERATURE LEAVING THE NON-REGEN HX.

IF THE SYSTEM PRESSURE UPSTREAM OF THE REJECT FLOW CONTROL VALVE DECREASES TO LESS THAN 5 PSIG, THE VALVE WILL CLOSE UNTIL PRESSURE INCREASES. IT WILL THEN RE-OPEN AND WILL OSCILLATE AS PRESSURE CYCLES ABOUT THE 5 PSIG SETPOINT.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE REJECT FLOW CONTROL VALVE.

CONTROL ROOM INDICATIONS:

RWCU SYSTEM FLOWS

RWCU SYSTEM TEMPERATURES

RWCU SYSTEM PRESSURES

ANNUNCIATORS:

CLEANUP PUMP SUCTION PRESSURE LOW	CRP 904 A2 (5-2)
CLEANUP NON REGEN HX OUT HI TEMPERATURE	CRP 904 A2 (8-1)

REF: P&ID 29130
OP 303
GEK 9537A

CU08 RWCU ISOLATION VALVE 1-CU-28 BINDS

VARIABLE (0-100% VALVE POSITION)

- RWCU RETURN VALVE 1-CU-28 BINDS

TYPE: SPECIFIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: MECHANICAL BINDING OF VALVE OPERATOR

PLANT STATUS: ANY

EFFECTS: WHILE THE OUTBOARD INLET ISOLATION VALVE IS OPERATING, EITHER DUE TO MANUAL OR AUTOMATIC CONTROL SIGNALS, THE VALVE MOTOR SUPPLY BREAKER WILL TRIP DUE TO OVERLOAD WHEN THE VALVE PASSES THROUGH THE INSTRUCTOR SPECIFIED POSITION. THE LOSS OF POWER WILL BE SEEN BY LOSS OF THE VALVE POSITION INDICATING LIGHTS. ALL CLEANUP PUMPS WILL TRIP WHEN THIS CONTROL POWER IS LOST, EVEN THOUGH THE VALVE IS NOT FULLY CLOSED.

REMOVAL OF THIS MALFUNCTION AND RESET OF OVERCURRENT WITH REMOTE FUNCTION EDR17 WILL RESTORE POWER TO THE VALVE. IT WILL REMAIN AT ITS CURRENT POSITION UNTIL ORDERED EITHER OPEN OR CLOSED. THIS MAY CAUSE LOWER THAN NORMAL SYSTEM FLOW.

CONTROL ROOM INDICATIONS:

VALVE POSITION INDICATING LIGHTS

RWCU SYSTEM FLOW

RWCU SYSTEM PRESSURE

REF: P&ID 29130
CWD 684
OP 303

CU09 LOSS OF MAIN RWCU PUMP BREAKER CONTROL POWER

A - RWCU RECIRC PUMP A LOSS OF CONTROL POWER

B - RWCU RECIRC PUMP B LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES

PLANT STATUS: 100% POWER

EFFECTS: BOTH INDICATING LIGHTS WILL GO OUT AND THE PUMP TRIP ANNUNCIATOR WILL ACTUATE, EVEN IF NOT RUNNING. IF RUNNING, THE PUMP WILL CONTINUE TO RUN AND WILL NOT TRIP. IF THE PUMP TRIP MALFUNCTION CU01 IS ACTIVATED, THE OVERCURRENT CONDITION WILL BE SEEN ON THE 4KV BUS WHICH WILL TRIP. IF THE PUMP IS NOT RUNNING, IT WILL NOT START.

REMOVAL OF THIS MALFUNCTION WILL RESTORE CONTROL POWER AND NORMAL OPERATION OF THE PUMP.

CONTROL ROOM INDICATIONS:

PUMP INDICATING LIGHTS

PUMP DISCHARGE PRESSURE

ANNUNCIATORS:

CLEANUP PUMP "A" TRIPPED BY OVLD	CRP 904 A2 (1-3)

B -- SIMILAR TO MALF A.

REF: P&ID 29130
CWD 680
OP 303

CU10 LOSS OF AUX RWCU JMP BREAKER CONTROL POWER

- RWCU AUX PUMP LOSS OF CONTROL POWER

TYPE: SPECIFI

CAUSE: BLOWN FUSES

PLANT STATUS: STARTUP

EFFECTS: BOTH INDICATING LIGHTS WILL GO OUT. IF RUNNING, THE PUMP WILL CONTINUE TO RUN. IT WILL NOT TRIP DUE TO A MANUAL TRIP SIGNAL OR ANY AUTOMATIC TRIP SIGNAL EXCEPT FOR AN OVERCURRENT SUCH AS MALFUNCTION CU02. IF THE PUMP IS NOT RUNNING, IT CAN NOT BE STARTED.

REMOVAL OF THIS MALFUNCTION WILL RESTORE CONTROL POWER AND NORMAL OPERATION OF THE PUMP.

CONTROL ROOM INDICATIONS:

PUMP INDICATING LIGHTS

RWCU SYSTEM PRESSURES

RWCU SYSTEM FLOWS

REF: P&ID 29130
CWD 682
OP 303

CW01 CIRC WATER PUMP TRIP

A - CIRC WATER PUMP A TRIP

B - CIRC WATER PUMP B TRIP

C - CIRC WATER PUMP C TRIP

D - CIRC WATER PUMP D TRIP

TYPE: GENERIC

CAUSE: OVERCURRENT RELAY TRIP (50)

PLANT STATUS: 100% POWER

EFFECTS: THE PUMP WILL IMMEDIATELY INDICATE TRIPPED. MOTOR AMPS WILL SPIKE THEN DECREASE IMMEDIATELY TO ZERO. CONDENSER INLET VALVE V4-1A WILL CLOSE. CONDENSER VACUUM WILL DECREASE.

THE SEVERITY OF THE VACUUM DECREASE IS DEPENDANT ON CW INLET TEMPERATURE, AND THE OPERATING PUMP COMBINATION.

VACUUM CAN BE MONITORED ON CRP 907 RECORDERS PR-1-1A & -1B, AND PI-1-3. IF ACTIVE WHEN STARTING THE PUMP, THE PUMP WILL START AND IMMEDIATELY TRIP.

REMOVAL OF THIS MALFUNCTION WILL RESET THE RELAY PROTECTION.

CONTROL ROOM INDICATIONS:

CW PUMP A INDICATION

CW PUMP A CURRENT INDICATION

CW PUMP A DISCHARGE VALVE (V4-1A) CLOSING

CONDENSER VACUUM

ANNUNCIATORS:

CIRCULATING WATER PUMP A OVERLOAD OR TRIP	CRP 906 A2-1 (5-1)

B-D -- SIMILAR TO MALF. A.

REF: P&ID 26015
CWD 140,163
OP 323

CW02 TRAVELING SCREEN FOULING

VARIABLE (100% = 30" LEVEL DIFFERENCE)

A - INTAKE SCREEN A FOULING

B - INTAKE SCREEN B FOULING

C - INTAKE SCREEN C FOULING

D - INTAKE SCREEN D FOULING

E - INTAKE SCREEN E FOULING

TYPE: GENERIC, VARIABLE (100% = 30" LEVEL DIFFERENCE)

CAUSE: DEBRIS IN CW INTAKE

PLANT STATUS: 100% POWER

EFFECTS: A -- THE DIFFERENTIAL LEVEL INDICATION WILL IMMEDIATELY BEGIN TO INCREASE. SCREEN WASH WILL HAVE NO EFFECT ON THE RATE AT WHICH THE SCREEN DIFF. LEVEL INCREASES. AT 10" DIFF LEVEL THE HIGH D/P LIGHT WILL LITE AND THE INTAKE TROUBLE ANNUNCIATOR WILL ALARM. AT 30" DIFFERENTIAL LEVEL, THE "A" CW PUMP MAY BE MANUALLY TRIPPED. AFTER THE CW PUMP TRIP, THE DIFF LEVEL WILL SLOWLY DECREASE BACK TOWARDS 0. IF THE CW PUMP "A" IS RESTARTED, THE DIFF. LEVEL WILL AGAIN INCREASE AS A FUNCTION OF FLOW OUT OF THE SUCTION BAY.

CONTROL ROOM INDICATIONS:

SCREEN HIGH D/P AMBER LIGHT (AT 10")

SCREEN BAY WATER DIFF INDICATOR (0-60")

ANNUNCIATORS:

INTAKE TROUBLE	CRP 906 A2-2 (6-6)

B-E -- SIMILAR TO MALF. A EXCEPT:

E - DECREASES MORE SLOWLY SINCE FLOW OUT (SW ONLY) IS MUCH LESS. SW PUMPS MAY CAVITATE, DEPENDING ON FLOW FROM SW AND ESW PUMPS, BUT WILL NOT TRIP.

B & C - DECREASE MORE RAPIDLY DUE TO THE EFFECT OF ANY OPERATING SW PUMP. SW PUMPS MAY CAVITATE BUT WILL NOT TRIP

CW02

REF: P&ID 26015
OP 323

CW03 SPARE

CW04 MAIN CONDENSER TUBE RUPTURE

VARIABLE (100% = 100 GPM)

A - CONDENSER A TUBE RUPTURE

B - CONDENSER B TUBE RUPTURE

C - CONDENSER C TUBE RUPTURE

D - CONDENSER D TUBE RUPTURE

TYPE: GENERIC, VARIABLE (100% = 100 GPM)

CAUSE: TUBE FAILURE

PLANT STATUS: 100% POWER

EFFECTS: CONDENSER HOTWELL CONDUCTIVITY FROM THE AFFECTED AREA WILL RAPIDLY BE PEGGED HIGH. THE INTRUSION WILL PROMPTLY PROPAGATE THRU TO THE CONDENSATE AND FEEDWATER SYSTEMS.

DEPENDING ON THE CONDITION OF THE FEEDWATER DEMINERALIZERS, THE CONDUCTIVITY MAY PROPAGATE TO THE VESSEL AND RWCU SYSTEM

CONTROL ROOM INDICATIONS:

CONDENSERS HOTWELL CONDUCTIVITY

CONDENSATE PUMP DISCH CONDUCTIVITY

BOOSTER PUMP DISCH CONDUCTIVITY

FEEDWATER CONDUCTIVITY

REACTOR WATER CONDUCTIVITY

RWCU EFFLUENT CONDUCTIVITY

ANNUNCIATORS:

CONDENSER HOTWELL CONDUCTIVITY HIGH	CRP 906 A1-1 (1-1)
CONDENSATE PUMP DISCHARGE CONDUCTIVITY HIGH 1	CRP 906 A1-2 (5-7)
CONDENSATE PUMP DISCHARGE CONDUCTIVITY HIGH-HIGH 15	CRP 906 A1-2 (6-7)

CW04

BOOSTER PUMP DISCHARGE CONDUCTIVITY HIGH (CRP 905)	CRP 908 A1-2 (6-7)
BOOSTER PUMP DISCHARGE CONDUCTIVITY HIGH (CRP 931)	CRP 908 A1-2 (7-8)
BOOSTER PUMP DISCHARGE CONDUCTIVITY HIGH-HIGH (CRP 931)	CRP 908 A1-2 (7-7)
BOOSTER PUMP DISCHARGE CONDUCTIVITY HIGH-HIGH (CRP 905)	CRP 908 A1-2 (6-8)
CONDENSATE DEMINERALIZER TROUBLE	CRP 906 (14B) A2-1 (4-3)
FEEDWATER HI COND .2	CRP 907 A1-2 (3-7)
CLEANUP SYSTEM HI CONDUCTIVITY	CRP 904 A2 (5-1)
REACTOR WATER CONDUCTIVITY HIGH-HIGH	CRP 904 A2 (9-4)

ISOLATION OF THE WATERBOX WILL RESULT IN STOPPAGE OF ALL SALT WATER LEAKAGE. REMOVAL OF THE MALFUNCTION WILL REMOVE THE TUBE LEAK, BUT NOT THE CONDUCTIVITY. THE CONDUCTIVITY MUST BE REMOVED BY THE DEMINERALIZERS.

B-D SIMILAR TO MALF. A.

REF: P&ID 26015,26013
OP 515
OP 323

CW05 SPARE

CW06 LOSS OF VACUUM PRIMING

- LOSS OF VACUUM PRIMING

TYPE: SPECIFIC

CAUSE: BOTH VACUUM PRIMING PUMPS TRIPPED

PLANT STATUS: 100% POWER

EFFECTS: PRIMING TANK VACUUM WILL SLOWLY DECREASE. AS TANK VACUUM DECREASES, LEVEL IN ALL CONDENSER WATER BOXES WILL DECREASE. CIRCULATING WATER PUMP DISCHARGE PRESSURES WILL INCREASE, FLOWS WILL DECREASE, AND MOTOR AMPS WILL INCREASE IN ACCORDANCE WITH THE PUMP CURVES. THE REDUCED FLOW THROUGH THE CONDENSERS WILL CAUSE VACUUM TO DECREASE AND CIRCULATING WATER OUTLET TEMPERATURES TO INCREASE. THE TURBINE MAY TRIP DUE TO THE LOSS OF VACUUM.

IF ANY CIRCULATING WATER PUMP DISCHARGE PRESSURE EXCEEDS 13 PSIG FOR MORE THAN 10.5 SECONDS, THAT PUMP WILL STOP AND ITS DISCHARGE VALVE WILL CLOSE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE VACUUM PRIMING PUMPS.

CONTROL ROOM INDICATIONS:

CIRCULATING WATER TEMPERATURES

CIRCULATING WATER PUMP CURRENT

MAIN CONDENSER VACUUM

PPC CONDENSER CLEANLINESS CALCULATIONS

CONTROL ROOM ANNUNCIATORS:

CIRCULATING WATER PUMP DISCHARGE PRESSURE	CRP 906 A2-1 (6-1/6-4)

REF: P&ID 26019
CWD 144
OP 323, 507A

CW07	MAIN CONDENSER TUBE SHEET FOULING
	VARIABLE (100% = COMPLETE BLOCKAGE)
	A - CONDENSER A TUBE FOULING
	B - CONDENSER B TUBE FOULING
	C - CONDENSER C TUBE FOULING
	D - CONDENSER D TUBE FOULING

TYPE: GENERIC, VARIABLE (100% = COMPLETE BLOCKAGE)

CAUSE: MARINE GROWTH.

PLANT STATUS: 100% POWER

EFFECTS: A -- FLOW THRU THE WATER BOX WILL STOP. CONDENSER VACUUM WILL DECREASE. CW PUMP A AMPS WILL INCREASE. THE PUMP WILL STOP 10.5 SECONDS AFTER THE DISCHARGE PRESSURE EXCEEDS 13 PSIG, AND THE CONDENSER INLET VALVE WILL CLOSE.

DEACTIVATING THE MALFUNCTION RESTORES THE TUBE SHEET TO NORMAL. LESSER SEVERITIES WILL REDUCE CW FLOW BY THE SPECIFIED SEVERITY AND PUMP RESPONSE WILL BE IN ACCORDANCE WITH APPROPRIATE PERFORMANCE CURVES.

CONTROL ROOM INDICATIONS:

CW PUMP A AMPS

CONDENSER VACUUM INDICATION

CW OUTLET TEMPERATURES

PPC CONDENSER CLEANLINESS CALCULATIONS

ANUNCIATORS:

CIRCULATING WATER PUMP A PUMP A DISCH PRESS	CRP 906 A2-1 (6-1)

B-D -- SIMILAR TO MALF. A.

REF: P&ID 26015
CWD 140
OP 323, 507A

CW08 CW PUMP DISCHARGE VALVE BINDS

VARIABLE (0-100% VALVE POSITION)

A - CW PUMP A DISCHG VALVE BINDS

B - CW PUMP B DISCHG VALVE BINDS

C - CW PUMP C DISCHG VALVE BINDS

D - CW PUMP D DISCHG VALVE BINDS

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: VALVE BINDING RESULTS IN THERMAL OVERLOAD (49)

PLANT STATUS: ANY

EFFECTS: A -- WHEN THE CONDENSER A INLET VALVE OPERATES THROUGH THE SPECIFIED POSITION, IT WILL BIND AND TRIP ON THERMAL OVERLOAD. THE VALVE WILL STOP AT ITS PRESENT POSITION AND THE INDICATING LIGHTS WILL GO OUT.

IF THE VALVE POSITION IS LESS THAN 20% OPEN, SUBSEQUENT PUMP START SIGNALS WILL NOT START THE CIRC WATER PUMP.

IF THE VALVE POSITION IS GREATER THAN OR EQUAL TO 20% OPEN, THE CIRC WATER PUMP WILL START NORMALLY, BUT FLOW WILL BE LOWER THAN NORMAL AND MOTOR CURRENT WILL BE LOWER THAN NORMAL, IN ACCORDANCE WITH THE PUMP CURVE. IF DISCHARGE PRESSURE REMAINS ABOVE 13 PSIG FOR MORE THAN 10.5 SECONDS, THE PUMP WILL STOP, BUT THE DISCHARGE VALVE WILL NOT OPERATE. THE PUMP MAY BE RESTARTED, BUT IT WILL STOP AGAIN.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVER-CURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESET THE OVERLOAD AND RESTORE NORMAL OPERATION OF THE VALVE. THE VALVE WILL REMAIN AT ITS PRESENT POSITION UNTIL THE PUMP CONTROL SWITCH IS PLACED IN THE STOP OR START POSITION, AT WHICH TIME THE VALVE WILL CLOSE OR OPEN, RESPECTIVELY.

CONTROL ROOM INDICATIONS:

V4-1A INDICATION

CW PUMP A AMPS

CW OUTLET TEMPERATURES

CW08

CONTROL ROOM ANNUNCIATORS:

NONE

B-D SIMILAR TO MALF. A

REF: CWD 163

CW09 SPARE

CW10 MAIN CONDENSER CW OUTLET VALVE BINDS

VARIABLE (0-100% VALVE POSITION)

A - CONDENSER A OUTLET VALVE BINDS

B - CONDENSER B OUTLET VALVE BINDS

C - CONDENSER C OUTLET VALVE BINDS

D - CONDENSER D OUTLET VALVE BINDS

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: VALVE BINDS, RESULTS IN THERMAL OVERLOAD

PLANT
STATUS: ANY

EFFECTS: A -- WHEN THE CONDENSER A OUTLET VALVE OPERATES THROUGH THE SPECIFIED POSITION, IT WILL BIND AND TRIP ON THERMAL OVERLOAD. THE VALVE WILL STOP AT ITS PRESENT POSITION AND THE INDICATING LIGHTS WILL GO OUT.

IF OPERATING IN RESPONSE TO BACKWASHING SELECTION, THE VALVE SEQUENCING WILL STOP IF THE VALVE FAILS TO REACH THE REQUIRED FULL TRAVEL POSITION.

IF THE VALVE IS NOT FULLY OPEN, THE INLET VALVE WILL NOT OPEN AND THE CW PUMP WILL NOT START.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVER-CURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESET THE OVERLOAD AND ALLOW THE VALVE TO TRAVEL TO ITS ORDERED POSITION.

CONTROL ROOM INDICATION:

V4-4A INDICATION

CW TEMPERATURES

B-D SAME EFFECT AS FOR A

REF: P&ID 26015
CWD 164,166
OP 323

CW11 MAIN CONDENSER CW X-CONN VALVE BINDS

VARIABLE (0-100% VALVE POSITION)

A - CW INLET X-CONN VALVE 2A BINDS

B - CW OUTLET X-CONN VALVE 3A BINDS

C - CW INLET X-CONN VALVE 2B BINDS

D - CW OUTLET X-CONN VALVE 3B BINDS

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: VALVE BINDS, CAUSING THERMAL OVERLOAD (49)

PLANT STATUS: 75% POWER, SECURING THE A CW PUMP

EFFECTS: A -- WHEN THE VALVE OPERATES THROUGH THE SPECIFIED POSITION, IT WILL BIND AND TRIP ON THERMAL OVERLOAD. THE VALVE WILL REMAIN AT ITS PRESENT POSITION AND THE INDICATING LIGHTS WILL GO OUT.

IF THE VALVE WAS OPERATING IN RESPONSE TO BACKWASH SELECTION, VALVE SEQUENCING WILL STOP IF THE VALVE FAILS TO REACH ITS REQUIRED FULL TRAVEL POSITION.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVER-CURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESET THE OVERLOAD AND ALLOW THE VALVE TO TRAVEL TO ITS ORDERED POSITION.

CONTROL ROOM INDICATION:

V4-2A INDICATION

CW TEMPERATURES

B-D -- SIMILAR TO MALF. A.

REF: P&ID 26015
CWD 31001,SHEET 165
OP 323

CW12 LOSS OF CW PUMP BREAKER CONTROL POWER

A - CIRC PUMP A LOSS OF CONTROL POWER

B - CIRC PUMP B LOSS OF CONTROL POWER

C - CIRC PUMP C LOSS OF CONTROL POWER

D - CIRC PUMP D LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSE

PLANT STATUS: 100% POWER

EFFECTS: A - CW PUMP A ON AND OFF INDICATION WILL BOTH BE OUT. IT WILL NOT BE POSSIBLE TO START OR STOP THE PUMP FROM CRP 906. IF MALFUNCTION CW01 IS ACTIVE CONCURRENTLY THE BREAKER WILL NOT TRIP AS A RESULT, AND THE OVERCURRENT WILL BE SEEN ON THE BUS. THE BREAKER WILL NOT TRIP DUE TO ANY AUTOMATIC TRIP.

CONTROL ROOM INDICATIONS:

CW PUMP A INDICATION

CW PUMP A AMP INDICATION

DEACTIVATING MALFUNCTION WILL REPLACE THE BLOWN FUSE AND RESTORE INDICATION AND OPERATION TO NORMAL.

B-D -- SIMILAR TO MALF. A.

REF: CWD 140

ED01 LOSS OF EMERGENCY STATION SERVICE TRANSFORMER

- E.S.S.T. TRIP

TYPE: SPECIFIC

CAUSE: INTERNAL SHORT CIRCUIT CAUSES ACTUATION OF THE FAULT

PLANT STATUS: PRESSURE RELAY

EFFECTS: ANY

IF EITHER SIDE OF THE E.S.S.T. IS ENERGIZED, THE FAULT PRESSURE RELAY WILL CAUSE THE 86/5D LOCKOUT RELAY TO TRIP AND THE ANNUNCIATOR TO ACTUATE. THE PRIMARY SUPPLY DISCONNECT AND THE SECONDARY OUTPUT BREAKER WILL OPEN.

IF POWER WAS BEING SUPPLIED THROUGH THE TRANSFORMER, ALL SUPPLIED BUSES AND LOADS WILL BE DEENERGIZED. IF THIS MALFUNCTION REMAINS ACTIVE MORE THAN THREE HOURS, THE GAS TURBINE BATTERY WILL BE DEPLETED AND IT WILL NOT BE ABLE TO START.

IF THE TRANSFORMER IS NOT ENERGIZED, NO EFFECTS WILL BE SEEN FROM THIS MALFUNCTION.

REMOVAL OF THIS MALFUNCTION WILL RESET THE FAULT PRESSURE TRIP RELAY AND ALLOW NORMAL OPERATION OF THE TRANSFORMER.

CONTROL ROOM INDICATIONS:

TRANSFORMER VOLTAGE AND CURRENT

ANNUNCIATORS:

EMER SS TRANSFORMER FAULT PRESSURE TRIP	CRP 908 A2-1 (4-2)
GAS TURBINE TROUBLE	CRP 908 A1-1 (9-2)
27 KV LINE UNDERVOTAGE	CRP 908 A2 (8-2)

REF: CWD 122
OP 341

ED02 LOSS OF NORMAL STATION SERVICE TRANSFORMER

- N.S.S.T. TRIP

TYPE: SPECIFIC

CAUSE: DIFFERENTIAL CURRENT TRIP

PLANT STATUS: 100% POWER

EFFECTS: THE GENERATOR LOCKOUT #1 AND #2 WILL TRIP AND THE DIFFERENTIAL TRIP ANNUNCIATOR WILL ACTUATE. THE MAIN GENERATOR BREAKERS 5T AND 6T AND THE GENERATOR FIELD BREAKER WILL TRIP. THE 4 KV BUSES WILL FAST TRANSFER TO THE R.S.S.T.

THE GENERATOR LOCKOUT WILL TRIP THE TURBINE AND THE REACTOR WILL SCRAM. THE STATOR COOLING PUMPS TRIP. THE BYPASS VALVES WILL OPEN TO CONTROL REACTOR PRESSURE.

IF TURBINE FIRST STAGE PRESSURE IS BELOW 45% LOAD, REACTOR SCRAM WILL NOT OCCUR.

IF THIS MALFUNCTION IS ACTIVATED WITH THE TRANSFORMER DEENERGIZED, NO EFFECTS WILL BE SEEN.

REMOVAL OF THIS MALFUNCTION WILL RESET THE DIFFERENTIAL CURRENT TRIP AND RESTORE NORMAL OPERATION OF THE TRANSFORMER.

CONTROL ROOM INDICATIONS:

GENERATOR LOCKOUT RELAYS TRIP

TRANSFORMER VOLTAGE AND CURRENT

TRANSFER TO R.S.S.T.

ANNUNCIATORS:

NORM SS TRANSFORMER DIFF CURRENT TRIP	CRP 907 A2-1 (3-2)
GENERATOR LOCKOUT RELAY NO. 1 LOSS OF DC	CRP 907 A2 (9-1)
GENERATOR LOCKOUT RELAY NO. 2 LOSS OF DC	CRP 907 A2 (9-2)

REF: CWD 2300
OP 340

ED03 SPARE

ED04 LOSS OF RESERVE STATION SERVICE TRANSFORMER

- R.S.S.T. TRIP

TYPE: SPECIFIC

CAUSE: OVERCURRENT TRIP

PLANT STATUS: SHUTDOWN

EFFECTS: THE TRANSFORMER LOCKOUT WILL TRIP ISOLATING THE TRANSFORMER AND RESULTING IN L.N.P. THE OVERCURRENT ANNUNCIATOR WILL ACTUATE. THE DIESEL GENERATOR AND GAS TURBINE GENERATOR WILL START AND REENERGIZE THE EMERGENCY BUSES.

IF THE MAIN TRANS IS SUPPLYING HOUSE LOADS THROUGH THE N.S.S.T., THE ONLY EFFECT WILL BE ISOLATION OF THE RSST.

REMOVAL OF THIS MALFUNCTION WILL RESET THE OVERCURRENT TRIP DEVICE AND ALLOW THE LOCKOUT TO BE RESET.

CONTROL ROOM INDICATIONS:

TRANSFORMER LOCKOUT RELAY 86-2/ST1

TRANSFORMER VOLTAGE AND CURRENT

DIESEL GENERATOR AUTO START

GAS TURBINE AUTO START

ANNUNCIATORS:

RES SS TRANSFORMER OVERCURRENT TRIP	CRP 908 A2-1 (3-4)
RES SS TRANSFORMER TRIP OR LOSS OF DC CONTROL	CRP 908 A2-2 (3-5)
RES TRANSFORMER PRI TONE TRANSFER TRIP RECD	CRP 908 A2-1 (9-3)
RES TRANSFORMER BU TONE TRANSFER TRIP RECD	CRP 908 A2-1 (9-4)

REF: CWD 226A
OP 341

ED05 LOSS OF 4160 VOLT BUS

A - 4KV BUS 14A FEEDER TRIP

B - 4KV BUS 14B FEEDER TRIP

C - 4KV BUS 14C FEEDER TRIP

D - 4KV BUS 14D FEEDER TRIP

E - 4KV BUS 14E FEEDER TRIP

F - 4KV BUS 14F FEEDER TRIP

G - 4KV BUS 14G FEEDER TRIP

TYPE: GENERIC

CAUSE: SHORT CIRCUIT ON THE BUS

PLANT STATUS: 100% POWER

EFFECTS: A -- THE FEEDER BREAKER WILL TRIP AND BUS 14A WILL BE DEENERGIZED. ALL LOADS SUPPLIED FROM THAT BUS WILL LOSE POWER AND THE BREAKER STATUS LIGHT WILL INDICATE TRIPPED.

THE BUS WILL LOAD SHED AND THE REACTOR WILL SCRAM.

IF THE BREAKER CONTROL SWITCH IS PLACED IN THE CLOSE POSITION, THE BREAKER WILL CLOSE BUT WILL IMMEDIATELY TRIP. THIS MALFUNCTION WILL TRIP EITHER THE RSST OR THE NSST FEEDER BREAKER.

REMOVAL OF THIS MALFUNCTION WILL REMOVE THE FAULT ON THE BUS AND RESTORE NORMAL OPERATION OF THE BREAKER.

CONTROL ROOM INDICATIONS:

BREAKER STATUS LIGHTS

BUS VOLTAGE

FEEDER BUS CURRENT

ANNUNCIATORS:

BUS 14A/B/C/D UNDER VOLTAGE SCRAM	CRP 905 A3 (4-3)
4 KV BUS 14A NORM SS TRANSFORMER TRIP	CRP 908 A1-1 (1-3)

ED05

4 KV BUS 14A RES SS TRANSFORMER TRIP	CRP 908 A1-1 (1-4)
BUS 14A DEGRADED VOLTAGE B-D -- SIMILAR TO MALF A E-G SIMILAR TO MALF A, BUT DO NOT CAUSE DIRECT REACTOR SCRAM	CRP 908 A1 (7-4)

REF: CWD 261
OP 341

ED06 LOSS OF 480 VOLT BUS

C - 480V BUS 12C NORMAL FEEDER TRP

D - 480V BUS 12D NORMAL FEEDER TRP

E - 480V BUS 12E NORMAL FEEDER TRP

F - 480V BUS 12F NORMAL FEEDER TRP

TYPE: GENERIC

CAUSE: SHORT CIRCUIT ON THE BUS

PLANT STATUS: ANY

EFFECTS: C -- THE FEEDER BREAKER WILL TRIP AND BUS 12C WILL BE DEENERGIZED. ALL LOADS SUPPLIED FROM THAT BUS WILL LOSE POWER. THE BREAKER TRIPPED ANNUNCIATOR WILL ACTUATE, AND THE BUS WILL LOAD SHED.

IF THE BREAKER CONTROL SWITCH IS PLACED IN THE CLOSE POSITION, THE BREAKER WILL CLOSE BUT WILL IMMEDIATELY TRIP.

REMOVAL OF THIS MALFUNCTION WILL REMOVE THE FAULT ON THE BUS AND RESTORE NORMAL OPERATION OF THE BREAKER.

CONTROL ROOM INDICATIONS:

BREAKER STATUS LIGHTS

BUS VOLTAGE

FEEDER BUS CURRENT

ANNUNCIATORS:

480V BUS 12C	CRP 908 A1-1
FEEDER TRIP	(5-2)

D-F -- SIMILAR TO MALF A.

REF: CWD 291
OP 342

ED07 LOSS OF 125 VDC BUS

A - 125VDC BUS 101A TRIP

B - 125VDC BUS 101B TRIP

TYPE: GENERIC

CAUSE: BUS SHORT CIRCUIT

PLANT STATUS: ANY

EFFECTS: A -- BUS 101A WILL SHORT CAUSING BOTH THE BATTERY CHARGER OUTPUT BREAKER AND THE BATTERY BREAKER TO TRIP. THE BUS UNDERVOLTAGE AND CHARGER TROUBLE ANNUNCIATORS WILL ACTUATE. ALL LOADS SUPPLIED FROM BUS 101A WILL LOSE POWER AND APPROPRIATE TRIPS, AUTOMATIC ACTIONS AND ALARMS WILL OCCUR. IT WILL NOT BE POSSIBLE TO REENERGIZE THE BUS UNTIL THE MALFUNCTION IS REMOVED.

THE M.B.T. SUPPLYING BUS 101AB-1 MAY BE MANUALLY TRANSFERRED USING REMOTE FUNCTION EDR07.

ANNUNCIATORS ON CRP 905, 906, 907, WILL BE DE-ENERGIZED. THE POWER SUPPLY TO PANEL DC-11A-2 MAY BE MANUALLY TRANSFERRED TO 101B BY USING REMOTE FUNCTION EDR12.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESTORE POWER TO THE BUS.

CONTROL ROOM INDICATION:

BUS VOLTAGE

ANNUNCIATORS:

125V DC BUS 101A OR 101B UNDERVOLTAGE	CRP 908 A2-2 (8-8)
125V DC BATTERY CHARGER 101A TROUBLE	CRP 908 A1-2 (6-5)
STA BATTERY 101A OUTPUT BREAKER OPEN	CRP 908 A1-1 (8-4)
LOSS OF D.C. POWER CONTROL RM. PNL. (DC-11A-2)	CRP 908 A1-1 (9-1)

B -- SIMILAR TO MALF A, EXCEPT CRP 905, 906, AND 908 WILL

ED07

BE AFFECTED.

REF: CWD 324A
OP 344A

ED08 LOSS OF INSTRUMENT AC BUS

- INSTRUMENT AC BUS TRIP

TYPE: SPECIFIC

CAUSE: BUS SHORT CIRCUIT

PLANT STATUS: ANY

EFFECTS: BUS IAC-1 WILL SHORT CAUSING THE NORMAL FEEDER BREAKER FROM TRANSFORMER IRP-1 TO TRIP. THE AUTOMATIC BUS TRANSFER WILL SWITCH TO THE EMERGENCY SUPPLY AND THE FEEDER BREAKER FROM TRANSFORMER IV-1 WILL IMMEDIATELY TRIP. ALL LOADS SUPPLIED FROM THE INSTRUMENT AC BUS WILL LOSE POWER AND APPROPRIATE TRIPS AND ANNUNCIATORS WILL OCCUR, INCLUDING A "A" CHANNEL SCRAM AND MOISTURE SEPARATOR LOW LEVEL CAUSING A TURBINE TRIP.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL REMOVE THE SHORT CIRCUIT AND RECLOSE BOTH FEEDER BREAKERS. THE AUTOMATIC BUS TRANSFER WILL SWITCH BACK TO THE NORMAL SUPPLY.

CONTROL ROOM INDICATIONS:

INSTRUMENT AC LOADS FAIL

RWCU SYSTEM ISOLATES

ANNUNCIATORS:

NO DIRECT ANNUNCIATORS INDICATE A LOSS OF INSTRUMENT AC

REF: ONE-LINE 30008
OP 343

ED09 LOSS OF VITAL AC BUS

- VITAL AC BUS TRIP

TYPE: SPECIFIC

CAUSE: BUS SHORT CIRCUIT

PLANT STATUS: ANY

EFFECTS: BUS VAC-1 WILL SHORT CAUSING THE NORMAL FEEDER FROM THE VITAL AC MOTOR-GENERATOR TO TRIP. THE AUTOMATIC BUS TRANSFER WILL SWITCH TO THE EMERGENCY SUPPLY AND THE FEEDER BREAKER FROM TRANSFORMER IV-1 WILL IMMEDIATELY TRIP. THE EMERGENCY SERVICE ANNUNCIATOR WILL ACTUATE.

ALL LOADS SUPPLIED FROM THE VITAL AC BUS WILL LOSE POWER AND APPROPRIATE TRIPS AND ANNUNCIATORS WILL ACTUATE.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL REMOVE THE SHORT CIRCUIT AND RECLOSE BOTH FEEDER BREAKERS. THE AUTOMATIC BUS TRANSFER WILL SWITCH BACK TO NORMAL 15 MINUTES AFTER THE MG INPUT POWER IS RESTORED TO NORMAL, THEN THE ANNUNCIATOR WILL CLEAR.

CONTROL ROOM INDICATIONS:

VITAL AC BUS VOLTAGE

VITAL AC LOADS FAIL

RECIRC MG LOCKUP

FEED REG VALVES LOCKUP

PRESSURE CONTROL FAILS TO MPR

CW SCREEN WASH DP INDICATION FAILS

ANNUNCIATORS:

VITAL AC BUS ON EMERGENCY SERVICE	CRP 908 A2-2 (7-6)

REF: ONE-LINE 30008
CWD 321
OP 343

ED10 LOSS OF EMERG BUS MCC

E1 - EMERG BUS MCC E1 TRIP

E2 - EMERG BUS MCC E2 TRIP

E3 - EMERG BUS MCC E3 TRIP

E4 - EMERG BUS MCC E4 TRIP

E5 - EMERG BUS MCC E5 TRIP

E6 - EMERG BUS MCC E6 TRIP

EF7 - EMERG BUS MCC EF7 TRIP

F1 - EMERG BUS MCC F1 TRIP

F2 - EMERG BUS MCC F2 TRIP

F3 - EMERG BUS MCC F3 TRIP

F4 - EMERG BUS MCC F4 TRIP

F5 - EMERG BUS MCC F5 TRIP

F6 - EMERG BUS MCC F6 TRIP

EF9 - EMERG BUS MCC EF9 TRIP

TYPE: GENERIC

CAUSE: BUS SHORT CIRCUIT

PLANT STATUS: ANY

EFFECTS: E1 - THE MCC E1 SUPPLY BREAKER WILL TRIP AND THE FEEDER TRIP ANNUNCIATOR WILL ACTUATE. THE CURRENT SPIKE WILL BE SEEN ON BUS 12E. ALL LOADS SUPPLIED FROM MCC E1 WILL LOSE POWER AND APPROPRIATE TRIPS AND ANNUNCIATORS WILL OCCUR.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL REMOVE THE SHORT CIRCUIT AND ALLOW NORMAL OPERATION OF THE BREAKER.

CONTROL ROOM INDICATIONS:

BREAKER STATUS LIGHTS

BUS 12E CURRENT

ANNUNCIATORS:

ED10

480V BUS 12E FEEDER TRIP — CRP 908 A2-2 (5-6)

E2-EF9 -- SIMILAR TO MALF A.

REF: CWD 300
OP 342

ED11 FAST TRANSFER TO RSS FAILURE

A - AUTO TRANSFER TO RSST FAILURE, BUS 14A

B - AUTO TRANSFER TO RSST FAILURE, BUS 14B

C - AUTO TRANSFER TO RSST FAILURE, BUS 14C

D - AUTO TRANSFER TO RSST FAILURE, BUS 14D

TYPE: GENERIC

CAUSE: LOOSE CONNECTIONS IN AUTO-TRANSFER CIRCUITS

PLANT STTAUS: GENERATOR TRIP

EFFECTS: FOLLOWING LOSS OF POWER FROM THE N.S.S.T., THE BREAKERS SUPPLYING POWER TO BUS 14A FROM THE RSST WILL NOT CLOSE BUT THE BREAKERS SUPPLYING POWER FROM THE N.S.S.T. WILL TRIP OPEN. MANUAL BREAKER OPERATION WILL STILL FUNCTION CORRECTLY.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE FAST TRANSFER CIRCUIT, BUT A TRANSFER WILL NOT TAKE PLACE UNTIL THE GENERATOR LOCKOUT RELAYS ARE RESET AND TRIP AGAIN.

CONTROL ROOM INDICATIONS:

BUS 14A-14D VOLTAGE

BUS 14A-14D FEEDER BREAKER POSITIONS

B-D -- SIMILAR TO MALF A.

REF: CWD 275,289
OP 342
ONE-LINE 30001

ED12 DIESEL SEQUENCE LOADING FAILURE

VARIABLE (100% = 25 SECONDS REMAINING)

- DG LOADING SEQUENCE TIMER FAILURE

98 % 1-SW-9 WILL NOT CLOSE AND SW PUMP D WILL NOT START

40 % TBSCCW PUMP B WILL NOT START

0 % INSTRUMENT AIR COMPRESSOR WILL NOT START

TYPE: SPECIFIC, VARIABLE (100% = 25 SECONDS REMAINING)

CAUSE: TIMER 62-2 MOTOR FAILURE

PLANT STATUS: LNP, DIESEL STARTING

EFFECTS: THE LOAD SEQUENCING TIMER WILL STOP WITH THE SPECIFIED TIME REMAINING. LOADS WHICH ARE STARTED BY CONTACTS SET AFTER THE SPECIFIED TIME WILL NOT AUTOMATICALLY START FOLLOWING LOSS OF NORMAL POWER.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE TIMER TO CONTINUE. LOADS WHICH HAD NOT ALREADY STARTED WILL THEN START AT THEIR NORMAL TIME INTERVALS.

THIS MALFUNCTION DOES NOT AFFECT THE SEQUENCING OF LPCI OR CORE SPRAY PUMPS WHICH ARE CONTROLLED BY THEIR OWN TIME DELAY CIRCUITRY.

CONTROL ROOM INDICATION:

1-SW-9 POSITION INDICATION

SW PUMP D STATUS

TBSCCW PUMP B STATUS

INSTRUMENT AIR COMPRESSOR STATUS

REF: CWD 136
OP 338

ED13 SPARE

ED14 LOSS OF OFF-SITE POWER

A - 345KV LINE 348 FAULT

B - 345KV LINE 383 FAULT

C - 345KV LINE 371 FAULT

D - 345KV LINE 310 FAULT

TYPE: GENERIC

CAUSE: GRID FAULT

PLANT STATUS: ANY

EFFECTS: A -- THE TWO BREAKERS CONNECTING LINE 348 TO THE SWITCHYARD WILL TRIP OPEN IF SHUT PRIOR TO THE FAULT.

CRP 909 STATUS LIGHTS WILL INDICATE ABNORMAL. VOLTAGE AND CURRENT ON LINE 348 WILL GO TO ZERO AND THE VOLTAGE AND CURRENT ON THE OTHER 345 KV LINES WILL REDISTRIBUTE BASED ON EXTERNAL PARAMETERS.

IF RECLOSE-RESET IS IN OPERATION, THE LINE BREAKER WILL RECLOSE ONCE AND TRIP IMMEDIATELY.

REMOVAL OF THIS MALFUNCTION WILL CORRECT THE GRID FAULT AND ALLOW RECLOSURE OF THE SWITCHYARD BREAKERS.

CONTROL ROOM INDICATIONS:

LINE BREAKER STATUS LIGHTS

LINE VOLTAGES AND CURRENTS

B-D -- SIMILAR TO MALF A.

IF ED14 IS ENTERED ON 3 OR MORE LINES, AND THE TOTAL STATION OUTPUT IS 1200 MWE OR MORE UNIT 1 WILL RECIEVE A LOAD REJECT (BREAKERS 5T-2 AND 6T-2 WILL OPEN.)

REF: GETAC 7020 MANUAL
OP 503A

ED15 MAIN TRANSFORMER CYCLING COOLING FANS FAILURE

- MAIN TRANSFORMER FAN FAILURE

TYPE: SPECIFIC

CAUSE: FAN CONTROLLER FAILURE

PLANT STATUS: 100% POWER

EFFECTS: MAIN TRANSFORMER TEMPERATURES WILL BEGIN INCREASING. WHEN ANY WINDING TEMPERATURE EXCEEDS 120 DEG C OR OIL TEMPERATURE EXCEEDS 90 DEG C, THE HIGH TEMPERATURE ANNUNCIATOR WILL ACTUATE. TRANSFORMER TEMPERATURES WILL RISE AND STABILIZE DEPENDING ON AMBIENT AIR TEMPERATURE (EXR01) AND REACTIVE LOAD. NO OTHER EFFECTS WILL OCCUR AS THE RESULT OF THIS MALFUNCTION.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE COOLING FANS.

CONTROL ROOM INDICATIONS:

MAIN TRANSFORMER TEMPERATURE TRENDS

ANNUNCIATORS:

MAIN TRANSFORMER HIGH TEMPERATURE OR LOSS OF DC	CRP 907 A2-1 (7-2)

REF: CWD 247A
OP 340

ED16 GETAC CHANNEL FAILURE

A - GETAC FAILURE 5T-2

B - GETAC FAILURE 5T-2 SYNC SEL

C - GETAC FAILURE 6T-2

D - GETAC FAILURE 6T-2 SYNC SEL

E - GETAC FAILURE 8T-2

F - GETAC FAILURE 8T-2 SYNC SEL

G - GETAC FAILURE 9T-2

H - GETAC FAILURE 9T-2 SYNC SEL

J - GETAC FAILURE IJS/GES SYNC SEL

K - GETAC FAILURE 348 HS RECLOSE

L - GETAC FAILURE 371 HS RECLOSE

M - GETAC FAILURE 383 HS RECLOSE

N - GETAC FAILURE SW 371-15-G-5

P - GETAC FAILURE 15G-1T-2

R - GETAC FAILURE 15G-3T-2

S - GETAC FAILURE SW 371-15-G-5

T - GETAC FAILURE 15G-4T-2

U - GETAC FAILURE SW 348-15-G-5

V - GETAC FAILURE BKR 7T-2

W - GETAC FAILURE SW (LATER)

X - GETAC FAILURE 13T-2 SYNC SEL

Y - GETAC FAILURE 310 HS RECLOSE

Z - GETAC FAILURE 14T-2 SYNC SEL

AA - GETAC FAILURE 14T-2

TYPE: GENERIC

CAUSE: CHANNEL LOGIC CARD FAILURE

ED16

PLANT
STATUS: ANY

EFFECTS: THE LOGIC CHANNEL WILL FAIL TO RESPOND TO ANY REQUESTED OPERATION. WHEN THE PUSHBUTTON IS PRESSED TO SELECT THE SPECIFIED ITEM, THE WHITE CHECKBACK LIGHT WILL MOMENTARILY INDICATE SELECTED. THE READY LIGHT WILL GO OUT. AFTER A DELAY OF ABOUT ONE SECOND, THE CHECKBACK LIGHT WILL GO OUT, THE CHANNEL FAILURE LIGHT WILL ILLUMINATE AND THE AUDIBLE ALARM AND ALARM LIGHT WILL ACTUATE. THE SELECTED ITEM WILL NOT CHANGE STATE.

THE FOLLOWING THREE ACTIONS MAY BE PERFORMED IN ANY SEQUENCE. PRESSING THE "SILENCE" PUSHBUTTON WILL STOP THE AUDIBLE ALARM. PRESSING THE "RESET" PUSHBUTTON WILL EXTINGUISH THE ALARM LIGHT. PRESSING THE "SELECTION RESET" PUSHBUTTON WILL EXTINGUISH THE CHANNEL FAILURE LIGHT. ANY OTHER ITEM MAY THEN BE SELECTED AND OPERATED NORMALLY.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION TO THE CHANNEL.

REF: GETAC 7020 MANUAL

NOTE: THIS MALFUNCTION NOT CERTIFIED

ED17 GETAC SPURIOUS ANNUNCIATOR

AA - (BLANK)

AB - (BLANK)

AC - (BLANK)

AD - B BUS PROT DC FAIL

AE - (BLANK)

AF - (BLANK)

AG - ACB 1T-2

AH - 6X17X TRANS TROUBLE

AI - (BLANK)

AJ - (BLANK)

BA - LOSS OF ANNUN DC

BB - ACB 4T-2

BC - FUTURE

BD - FUTURE

BE - FUTURE

BF - FUTURE

BG - FUTURE

BH - FUTURE

BI - 5 BUS PROT DC FAIL

BJ - (BLANK)

CA - MOD OVERLOAD

CB - GEN 2 TIE PRI DC & PW

CC - AUTO SYNC FAIL

CD - GEN SYNC GUARD FREQ

CE - GEN 2 TIE BU DC & PW

CF - SEL SW OFF

ED17

CG - GEN 1 TIE PRI DC & PW

CH - GEN 1 TIE BU DC & PW

CI - ACB PRI TRIP DC FAIL

CJ - PWR LIMIT MON DC FAIL

DA - BATTERY TROUBLE

DB - 440 VAC TRANS & SW

DC - ACB'S DC BKR'S TRIP

DD - LINE PROT SEL SW OFF

DE - MOD CONTACT TRANSFER

DF - GEN 3 TIE PRI DC & PW

DG - BKR FAIL LO TRIP

DH - BKR FAIL DC SUPPLY

DI - GEN 3 TIE BU DC & PW

DJ - LOCAL CONTROL

EA - RSS TRANS LOSS GUARD

EB - OIL ALARM

EC - ACB 8T-2

ED - ACB 9T-2

EE - GEN NO. 1 OUT OF STEP

EF - GEN NO. 2 OUT OF STEP

EG - LINE 348 CARR 26

EH - (BLANK)

EI - START UP TRANSF 2

EJ - ACB 7T-2

FA - 371 PRI RLY

FB - 371 BU RLY

ED17

FC - LN 383 PRI CARR 26 REL

FD - LINE 383 BU TONE REL

FE - 371 LN TT LOSS OF GUARD

FF - ACB 5T-2

FG - 383 LN TT LOSS OF GUARD

FH - (BLANK)

FI - ACB 6T-2

FJ - ACB 3T-2

TYPE: GENERIC

CAUSE: SPURIOUS ANNUNCIATOR INPUT SIGNAL

PLANT STATUS: ANY

EFFECTS: THE SPECIFIED GETAC ANNUNCIATOR WILL FLASH, THE AUDIBLE ALARM WILL ACTUATE AND THE ALARM LIGHT WILL FLASH.

THE FOLLOWING ACTIONS MAY BE PERFORMED IN ANY ORDER.

PRESSING THE "SILENCE" PUSHBUTTON WILL STOP THE AUDIBLE ALARM. PRESSING THE "RESET" PUSHBUTTON WILL CAUSE THE ANNUNCIATOR LIGHT TO REMAIN ON CONTINUOUSLY, AND THE ALARM LIGHT TO EXTINGUISH.

NO OTHER EFFECTS WILL OCCUR AS THE RESULT OF THIS MALFUNCTION. THAT IS, AN ANNUNCIATOR FOR A CONDITION WHICH SHOULD CAUSE A BREAKER TO TRIP WILL NOT TRIP THE BREAKER.

REMOVAL OF THIS MALFUNCTION WILL CAUSE THE ANNUNCIATOR WINDOW TO EXTINGUISH, EVEN IF IT HAS NOT BEEN RESET.

IF IT HAS NOT BEEN RESET, PRESSING THE "LAMP TEST" PUSHBUTTON FOR THE AFFECTED SECTION WILL CAUSE ALL ANNUNCIATORS ON THAT SECTION TO ILLUMINATE CONTINUOUSLY, EXCEPT THE ANNUNCIATOR WHICH ACTUATED AND CLEARED WHICH WILL FLASH.

REF: GETAC 7020 MANUAL

EG01 MAIN GENERATOR TRIP

- MAIN GENERATOR TRIP

TYPE: SPECIFIC

CAUSE: SPURIOUS DIFFERENTIAL OVERCURRENT TRIP

PLANT STATUS: 100% POWER

EFFECTS: DIFFERENTIAL CURRENT ANNUNCIATOR WILL ACTUATE. THE # 1 GENERATOR LOCKOUT RELAY WILL TRIP. THE MAIN GENERATOR BREAKERS 5T AND 6T AND THE GENERATOR FIELD BREAKER WILL TRIP. THE 4 KV BUSES WILL FAST TRANSFER TO THE R.S.S.T. THE MAIN TURBINE WILL TRIP AND THE REACTOR WILL SCRAM.

IF THIS MALFUNCTION IS ACTIVATED BELOW 45% TURBINE FIRST STAGE PRESSURE, THE REACTOR WILL NOT SCRAM.

REMOVAL OF THIS MALFUNCTION WILL RESET THE DIFFERENTIAL CURRENT TRIP RELAY AND ALLOW NORMAL OPERATION OF THE MAIN TRANSFORMER.

CONTROL ROOM INDICATIONS:

GENERATOR LOCKOUT RELAY

TRANSFER TO R.S.S.T.

TURBINE TRIP

REACTOR SCRAM

ANNUNCIATORS:

MAIN TRANSFORMER DIFFERENTIAL CURRENT TRIP	CRP 907 A2-2 (2-5)
TURBINE OVERSPEED TRIP	CRP 907 A1-2 (1-5)
TURBINE STOP VALVE CLOSURE	CRP 905 A2 (6-4)
REACTOR CHANNEL A SCRAM	CRP 905 A2 (8-3)
REACTOR CHANNEL B SCRAM	CRP 905 A2 (8-4)

REF: CWD 231A
OP 340

EG02 MAIN GENERATOR AUTO VOLTAGE REGULATOR OSCILLATION

VARIABLE (100% = PLUS OR MINUS 2 KV SWING)

- MAIN GEN AUTO VOLTAGE REG OSCILLATION

TYPE: SPECIFIC, VARIABLE (100% = PLUS OR MINUS 2 KV SWING)

CAUSE: AUTO REGULATOR FAILURE

PLANT STATUS: 100% POWER

EFFECTS: THE GENERATOR TERMINAL VOLTAGE WILL VARY PLUS OR MINUS 2 KV FROM THE AUTOMATIC REGULATOR SETPOINT. HOWEVER, THE UNDEREXCITED AND OVEREXCITED LIMITS WILL NOT BE EXCEEDED DURING THE OSCILLATION. THE OSCILLATION FREQUENCY WILL BE EQUAL TO THE MAXIMUM RATE OF CHANGE OF THE AUT[illegible] VOLTAGE REGULATOR. THE VOLTAGE DEVIATION WILL AFFECT THE GRID VOLTAGE REALISTICALLY. MANUAL OPERATION OF THE REGULATOR WILL NOT BE AFFECTED BY THE AUTO REGULATOR FAILURE.

DEACTIVATING THE MALFUNCTION WILL RETURN THE AUTO VOLTAGE REGULATOR TO NORMAL OPERATION.

CONTROL ROOM INDICATIONS:

GENERATOR CURRENT, PHASE A-C

GENERATED REACTIVE POWER

GENERATED POWER FACTOR

GENERATED VOLTAGE

GENERATOR FIELD VOLTAGE

GENERATOR FIELD CURRENT

EXCITER FIELD VOLTAGE

AMPLIDYNE VOLTAGE

ANNUNCIATORS:

GENERATOR EXCITATION MAXIMUM LIMIT	CRP 907 A2-1 (4-2)
GENERATOR FIELD TEMPERATURE HIGH/UNDERVOLTAGE	CRP 907 A2-2 (4-6)

REF: GEK 4738A VOLTAGE REGULATOR MANUAL
CWD 204,200A

EG03 SPARE

EG04 MAIN GENERATOR FIELD BREAKER TRIP

- MN GEN FIELD BREAKER TRIP

TYPE: SPECIFIC

CAUSE: SHORT OF THE BREAKER OPEN RELAY

PLANT STATUS: 100% POWER

EFFECTS: THE MAIN GENERATOR FIELD BREAKER WILL OPEN AND THE BREAKER OPEN ANNUNCIATOR WILL ACTUATE. GENERATED VOLTAGE WILL DECAY AND VARS WILL GO OFF SCALE NEGATIVE IN ABOUT 6-10 SECONDS. THE LOSS-OF-EXCITATION DEVICE 40 WILL TRIP THE TURBINE MASTER TRIP SOLENOID. TURBINE STOP, CONTROL, AND INTERMEDIATE VALVES CLOSE AND THE GEN. LOCKOUTS TRIP. BREAKERS 5T AND 6T OPEN AND THE REACTOR SCRAMS.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE RELAY AND ALLOW THE TURBINE TRIP TO BE RESET.

CONTROL ROOM INDICATIONS:

GENERATOR FIELD BREAKER INDICATION

GENERATOR VOLTAGE AND REACTIVE LOAD

MAIN GENERATOR BREAKER INDICATION

ANNUNCIATORS:

GENERATOR FIELD BREAKER OPEN/LOSS OF DC CONTROL CRP 907 A2-2 (4-7)

REF: CWD 202
OP 340,314

EG05 EMERGENCY DIESEL GENERATOR FAILS TO START

- DIESEL FAILS TO START

TYPE: SPECIFIC

CAUSE: AIR START VALVE FAILURE

PLANT STATUS: ANY

EFFECTS: THE DIESEL WILL FAIL TO START, BOTH MANUALLY AND AUTOMATICALLY. 10 SECONDS FOLLOWING EITHER MANUAL OR AUTOMATIC START SIGNAL, THE START FAILURE ANNUNCIATOR AND DIESEL LOCKOUT ARE ACTUATED.

IF THE DIESEL IS ALREADY RUNNING, NO EFFECTS WILL BE SEEN FROM THIS MALFUNCTION.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE AIR START MOTOR TO NORMAL. THE LOCKOUT RELAY MAY BE RESET USING REMOTE FUNCTION EGR01, IF NECESSARY.

CONTROL ROOM INDICATIONS:

DIESEL GENERATOR VOLTAGE

DIESEL GENERATOR POWER

DIESEL GENERATOR FREQUENCY

DIESEL GENERATOR MVARS

ANNUNCIATORS:

DIESEL GENERATOR STARTING FAILURE	CRP 908 A2-1 (1-3)
DIESEL GENERATOR LOCKOUT	CRP 908 A2-1 (1-1)
DIESEL GENERATOR TROUBLE	CRP 908 A2-2 (1-8)
DIESEL GENERATOR NOT READY FOR AUTO START	CRP 908 A2-1 (2-2)

REF: CWD 137
OP 338

EG06 EMERGENCY DIESEL GENERATOR TRIP

- DIESEL GENERATOR TRIP

TYPE: SPECIFIC

C[illegible] LOCKOUT RELAY 86 TRIP

PLANT STATUS: ANY

EFFECTS: THE DIESEL WILL STOP. IF SYNCHRONIZED TO BUS 14E [illegible] 14F, THE BREAKERS WILL TRIP. OPERATION OF THE MAC[illegible] WILL NOT BE POSSIBLE FROM THE CONTROL ROOM.

IF THE DIESEL IS NOT RUNNING WHEN THE MALFUNCTION IS ACTIVATED, THE LOCKOUT WILL STILL OCCUR AND DISABLE THE MACHINE.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE LOCKOUT RELAY TO BE RESET USING REMOTE FUNCTION EGR01.

CONTROL ROOM INDICATIONS:

DIESEL GENERATOR VOLTAGE

DIESEL GENERATOR POWER

DIESEL GENERATOR FREQUENCY

DIESEL GENERATOR MVARS

ANNUNCIATORS:

DIESEL GENERATOR LOCKOUT	CRP 908 A2-1 (1-1)
DIESEL GENERATOR TROUBLE	CRP 908 A2-2 (1-8)
DIESEL GENERATOR NOT READY FOR AUTO START	CRP 908 A2-1 (2-2)

REF: CWD 137,131
OP 338

EG07 EMERGENCY DIESEL GENERATOR SLOW START

- VARIABLE (100% = 10 ADDITONAL SECONDS)

- DIESEL GENERATOR SLOW START

TYPE: SPECIFIC, VARIABLE (100% = 10 ADDITONAL SECONDS)

CAUSE: GOVERNOR MALFUNCTION

PLANT STATUS: ANY

EFFECTS: WHEN STARTED, THE DIESEL WILL TAKE 10 EXTRA SECONDS TO REACH THE 810 RPM SETPOINT WHERE THE DIESEL RUNNING PERMISSIVE IS SET. THIS WILL RESULT IN A DIESEL GENERATOR STARTING FAILURE ALARM WHICH WILL STOP AND LOCKOUT THE ENGINE. OPERATION FROM THE CONTROL ROOM WILL NOT BE POSSIBLE DUE TO THE LOCKOUT. IF THE DIESEL IS ALREADY RUNNING, AT RATED SPEED AND/OR LOAD, THIS MALFUNCTION WILL HAVE NO EFFECT ON THE MACHINE OPERATION.

DEACTIVATING THE MALFUNCTION WILL RESTORE THE GOVERNOR TO NORMAL ELIMINATING THE LONG STARTING TIME. THE LOCKOUT MAY BE RESET USING REMOTE FUNCTION EGR01, IF NECESSARY.

CONTROL ROOM INDICATION:

DIESEL GENERATOR FREQUENCY

ANNUNCIATORS:

DIESEL GENERATOR STARTING FAILURE	CRP 908 A2-1 (1-3)
DIESEL GENERATOR TROUBLE	CRP 908 A2-2 (1-8)
DIESEL GENERATOR LOCKOUT	CRP 908 A2-1 (1-1)
DIESEL GENERATOR NOT READY FOR AUTO START	CRP 908 A2-2 (2-2)

REF: CWD 137
OP 338

EG08 EMERGENCY DIESEL GENERATOR SPEED CONTROL FAILURE

VARIABLE (100% = 10% SPEED OSCILLATION)

- DIESEL GENERATOR SPEED CONTROL FAILURE

TYPE: SPECIFIC, VARIABLE (100% = PLUS OR MINUS 10% OSCILL)

CAUSE: GOVERNOR SETPOINT DRIFT

PLANT STATUS: ANY CONDITION DIESEL OPERATING

EFFECTS: IF THE DIESEL IS NOT PARALLELED, THE SPEED OF THE MACHINE WILL OSCILLATE PLUS OR MINUS 90 RPM (6 HERTZ). OTHERWISE, THE OSCILLATION WILL BE PLUS OR MINUS 10% OF RATED LOAD OR 265 KW. IF THE CHANGE IS SUCH THAT ALL LOAD IS SHED FROM THE MACHINE, THE BREAKER WILL TRIP ON REVERSE POWER AT ITS USUAL SETPOINT.

THIS MALFUNCTION AFFECTS THE GOVERNOR ONLY AFTER THE ENGINE IS OPERATING AND HAS NO EFFECT DURING STARTING OF THE ENGINE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE GOVERNOR TO NORMAL OPERATION, AND RESET ANY RELAYS TRIPPED AS A RESULT OF THIS MALFUNCTION. THE LOCKOUT RELAY MUST BE RESET USING REMOTE FUNCTION EGR01, IF NECESSARY.

CONTROL ROOM INDICATIONS:

DIESEL GENERATOR POWER

DIESEL GENERATOR FREQUENCY

ANNUNCIATORS:

DIESEL GENERATOR TROUBLE	CRP 908 A2-2 (1-8)
DIESEL GENERATOR LOCKOUT	CRP 908 A2-1 (1-1)
DIESEL GENERATOR NOT READY FOR AUTO START	CRP 908 A2-1 (2-2)

REF: CWD 137
OP 338

EG09 GAS TURBINE FAILS TO START

- GAS TURBINE FAILS TO START

TYPE: SPECIFIC

CAUSE: SPEED SENSING SWITCH FAILURE

PLANT STATUS: ANY

EFFECTS: WHEN THE GAS TURBINE IS STARTED, IT WILL ACCELERATE NORMALLY, EXCEPT THAT THE SPEED SENSING DEVICE FOR LIGHT-OFF SPEED WILL NOT BE ACTUATED. FUEL WILL NOT BE SUPPLIED TO THE UNIT AND THE FLAME LIGHT WILL NOT COME ON. 20 SECONDS AFTER THE START SIGNAL WAS RECEIVED THE UNIT WILL TRIP. THE GAS TURBINE TROUBLE ANNUNCIATOR WILL ACTUATE AND THE SEQUENCE-IN-PROGRESS AND START LIGHTS WILL GO OUT.

ATTEMPTING TO RE-START THE GAS TURBINE WILL NOT PRODUCE ANY RESULTS UNLESS THE TRIP HAS BEEN RESET USING REMOTE FUNCTION EGR02.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE SPEED SENSING SWITCH TO NORMAL.

CONTROL ROOM INDICATIONS:

GAS TURBINE READY TO START LIGHT

GAS TURBINE SEQUENCE IN PROGRESS LIGHT

GAS TURBINE FLAME LIGHT

GAS TURBINE START LIGHT

ANNUNCIATORS:

GAS TURBINE TROUBLE	CRP 908 A1-1 (9-2)
GAS TURBINE NOT READY FOR AUTO START	CRP 908 A2-1 (2-3)

REF: CWD 68,1072
OP 339

EG10 GAS TURBINE TRIP

- GAS TURBINE TRIP

TYPE: SPECIFIC

CAUSE: GOVERNOR MALFUNCTION

PLANT STATUS: ANY, GAS TURBINE IN OPERATION

EFFECTS: THE GAS TURBINE LOCKOUT WILL TRIP CAUSING THE GAS TURBINE TO SHUTDOWN AND THE GENERATOR BREAKER TO OPEN.

IF RESTART IS ATTEMPTED, NOTHING WILL HAPPEN.

DEACTIVATING THE MALFUNCTION WILL ALLOW THE GAS TURBINE GENERATOR LOCKOUT TO BE RESET USING REMOTE FUNCTION

CONTROL ROOM INDICATIONS:

GAS GENERATOR FREQUENCY

GAS GENERATOR VOLTAGE

GAS GENERATOR LOAD

ANNUNCIATORS:

GAS TURBINE TROUBLE	CRP 908 A1-1 (9-2)
GAS TURBINE NOT READY FOR AUTO START	CRP 908 A2-1 (2-3)

REF: CWD 1072
OP 339

EG11 GAS TURBINE SLOW START

VARIABLE (100% = 10 ADDITIONAL SECONDS)

- GAS TURBINE SLOW START

TYPE: SPECIFIC, VARIABLE (100% = 50 ADDITIONAL SECONDS)

CAUSE: GOVERNOR FAILURE

PLANT STATUS: ANY, GAS TURBINE STARTUP

EFFECTS: THE GAS TURBINE GENERATOR WILL REQUIRE 50 ADDITIONAL SECONDS TO REACH OPERATING SPEED. NO OTHER EFFECTS WILL BE SEEN. THIS MALFUNCTION HAS NO OTHER CONSEQUENCES ON ANY ASPECT OF GAS TURBINE GENERATOR OPERATION.

DEACTIVATING THE MALFUNCTION WILL RESTORE THE START TIME TO NORMAL.

CONTROL ROOM INDICATIONS:

GAS GENERATOR FREQUENCY

GAS GENERATOR SEQUENCE IN PROGRESS LIGHT

GAS GENERATOR SEQUENCE COMPLETE LIGHT

ANNUNCIATORS:

NONE

REF: OP 339
CWD 68,1072

EG12 GAS TURBINE SPEED CONTROL FAILURE

VARIABLE (100% = PLUS OR MINUS 10% CHANGE)

- GAS TURBINE SPEED CONTROL FAILURE

TYPE: SPECIFIC, VARIABLE (100% = PLUS OR MINUS 10% CHANGE)

CAUSE: GOVERNOR SETPOINT OSCILLATION

PLANT STATUS: ANY, GAS GENERATOR OPERATING

EFFECTS: IF THE GAS GENERATOR IS NOT PARALLELED, THE SPEED OF THE MACHINE WILL OSCILLATE PLUS OR MINUS 6 HERTZ FREQUENCY.

OTHERWISE, THE OSCILLATION WILL BE PLUS OR MINUS 10% OF THE RATED LOAD. IF THE CHANGE DUE TO THE MALFUNCTION IS SUCH THAT ALL LOAD IS SHED FROM THE MACHINE, THE UNIT WILL TRIP ON REVERSE POWER AT ITS NORMAL SETPOINT.

THIS MALFUNCTION AFFECTS THE GOVERNOR ONLY AFTER THE GAS GENERATOR IS AT NORMAL OPERATING SPEED AND HAS NO EFFECT DURING STARTUP.

DEACTIVATING THE MALFUNCTION WILL RESTORE THE GOVERNOR TO NORMAL OPERATION.

CONTROL ROOM INDICATIONS:

GAS GENERATOR FREQUENCY

GAS GENERATOR LOAD

GAS GENERATOR MVARS

GAS GENERATOR VOLTAGE

ANNUNCIATORS:

NONE

REF: CWD 1072,68
OP 339

FW01 CONDENSATE PUMP TRIP

A - CONDENSATE PUMP A TRIP

B - CONDENSATE PUMP B TRIP

C - CONDENSATE PUMP C TRIP

TYPE: GENERIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: 100%

EFFECTS: A -- CONDENSATE PUMP A MOTOR WILL SHORT CAUSING ACTIVATION OF THE INSTANTANEOUS OVERCURRENT TRIP DEVICE (50). THE BREAKER WILL TRIP.

CONTROL PANEL INDICATIONS:

PUMP CURRENT SPIKES, THEN DROPS TO ZERO

CONDENSATE PUMP DISCHARGE PRESSURE DECREASES

CONDENSATE AND FEEDWATER PRESSURES AND FLOWS

REACTOR WATER LEVEL

ANNUNCIATORS:

CONDENSATE PUMP A OVERLOAD OR FAULT TRIP	906 A1-1 (1-1)
CONDENSATE PUMP A,B, OR C TRIP	906 A1-1 (1-4) (0.8-15 SEC DELAY)

IF OTHER CONDENSATE PUMPS ARE RUNNING, THE COMBINED CONDENSATE PUMP DISCHARGE PRESSURE WILL DECREASE IN ACCORDANCE WITH THE PUMP AND SYSTEM CHARACTERISTIC CURVES.

ATTEMPTING TO RESTART THE PUMP, OR AN AUTOMATIC START SIGNAL FROM FWCI, WILL RESULT IN THE BREAKER CLOSING AND TRIPPING IMMEDIATELY. THE BREAKER WILL NOT CONTINUE TO CYCLE DUE TO AN AUTOMATIC START SIGNAL, SINCE AUTO START SIGNALS PROVIDE FOR ONLY ONE BREAKER CLOSE SIGNAL.

REMOVAL OF THE MALFUNCTION WILL ALLOW NORMAL OPERATION OF THE PUMP.

B -- SIMILAR TO HALF A EXCEPT CONDENSATE PUMP B IS THE AFFECTED COMPONENT.

FW01

C -- SIMILAR TO MALF A EXCEPT CONDENSATE PUMP C IS THE AFFECTED COMPONENT AND IT IS NOT AFFECTED BY FWCI.

REF:	P&ID	26013
	CWD	356
	OP	315

FW02 CONDENSATE BOOSTER PUMP TRIP

A - COND BOOSTER PUMP A TRIP

B - COND BOOSTER PUMP B TRIP

C - COND BOOSTER PUMP C TRIP

TYPE: GENERIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: 100%

EFFECTS: A -- COND BOOSTER PUMP A MOTOR WILL SHORT CAUSING ACTIVATION OF THE INSTANTANEOUS OVERCURRENT TRIP DEVICE (50). THE BREAKER WILL TRIP.

CONTROL PANEL INDICATIONS:

PUMP CURRENT SPIKE

COND. BOOSTER PUMP DISCHARGE PRESSURE DECREASES

CONDENSATE AND FEEDWATER PRESSURES AND FLOWS

REACTOR WATER LEVEL

ANNUNCIATORS:

CONDENSATE BOOSTER PUMP A OVERLOAD OR FAULT TRIP	906 A1-1 (2-1)
CONDENSATE BOOSTER PUMP A,B, OR C TRIP	906 A1-1 (2-4) (0.8 SEC DELAY)

IF OTHER CONDENSATE BOOSTER PUMPS ARE RUNNING, THE COMBINED BOOSTER PUMP DISCHARGE PRESSURE WILL DECREASE IN ACCORDANCE WITH THE PUMP AND SYSTEM CHARACTERISTIC CURVES.

ATTEMPTING TO RESTART THE PUMP, OR AN AUTOMATIC START SIGNAL FROM FWCI, WILL RESULT IN THE BREAKER CLOSING AND TRIPPING IMMEDIATELY. THE BREAKER WILL NOT CONTINUE TO CYCLE DUE TO AN AUTOMATIC START SIGNAL SINCE AUTO START SIGNALS PROVIDE FOR ONLY ONE BREAKER CLOSE SIGNAL.

REMOVAL OF THE MALFUNCTION WILL ALLOW NORMAL OPERATION OF THE PUMP.

B -- SIMILAR TO MALF A EXCEPT CONDENSATE BOOSTER PUMP B IS THE AFFECTED COMPONENT.

FW02

C -- SIMILAR TO MALF A EXCEPT CONDENSATE BOOSTER PUMP C IS THE AFFECTED COMPONENT AND IT IS NOT AFFECTED BY FWCI.

REF:	P&ID	26013
	CWD	362
	OP	315

FW03 CONDENSATE DEMIN HI D/P

VARIABLE (100% = 50% BLOCKAGE)

A - COND DEMIN A HI D/P

B - COND DEMIN B HI D/P

C - COND DEMIN C HI D/P

D - COND DEMIN D HI D/P

E - COND DEMIN E HI D/P

F - COND DEMIN F HI D/P

G - COND DEMIN G HI D/P

TYPE: GENERIC, VARIABLE (100% = 50% BLOCKAGE)

CAUSE: BUILDUP OF SUSPENDED SOLIDS

PLANT STATUS: 100%

EFFECTS: A -- FLOW THROUGH DEMIN A WILL BE REDUCED DUE TO INCREASED RESISTANCE TO FLOW. THE FLOW WILL BE EVENLY DISTRIBUTED AMONG THE OTHER FIVE ON-LINE DEMINERALIZERS AND THE DIFFERENTIAL PRESSURE ACROSS THE DEMINERALIZER SYSTEM WILL INCREASE. 100% SEVERITY WILL RESULT IN A 50% REDUCTION OF FLOW THROUGH THE A DEMIN. ALL INCREASED RESISTANCE TO FLOW WILL BE IN THE RESIN, THEREFORE THE LOCAL RESIN STRAINER HIGH D/P ALARM WILL NOT ACTUATE.

THE LOCAL DEMIN EFFLUENT FLOW LOW ALARM MAY ACTUATE, ALONG WITH THE CONDENSATE DEMINERALIZER TROUBLE ALARM.

CONTROL PANEL INDICATIONS:

CONDENSATE DEMIN D/P

ANNUNCIATORS:

CONDENSATE DEMINERALIZER TROUBLE	CRP 906 A2-1 (4-3)

FURTHER INDICATIONS MAY BE OBSERVED IN INCREASED CONDENSATE PUMP DISCHARGE PRESSURE.

NO RESIN BEAD FRACTURING WILL OCCUR AS THE RESULT OF THIS MALFUNCTION.

FW03

B-G -- SIMILAR TO MALFUNCTION A EXCEPT THE AFFECTED COMPONENT WILL BE THE SPECIFIED DEMINERALIZER.

REF: P&ID 26013
CWD 1010
OP 315/515

FW04 CONDENSATE DEMIN RESIN DEPLETION

VARIABLE (100% = NO CONDUCTIVITY REDUCTION)

A - COND DEMIN A DEPLETION

B - COND DEMIN B DEPLETION

C - COND DEMIN C DEPLETION

D - COND DEMIN D DEPLETION

E - COND DEMIN E DEPLETION

F - COND DEMIN F DEPLETION

G - COND DEMIN G DEPLETION

TYPE: GENERIC, VARIABLE (100% = NO CONDUCTIVITY REDUCTION)

CAUSE: OLD RESIN

PLANT STATUS: 100%

EFFECTS: A -- THE A CONDENSATE DEMINERALIZER WILL LOSE ALL ABILITY TO REMOVE IONIC IMPURITIES. THE A DEMIN EFFLUENT CONDUCTIVITY WILL GO TO THE SAME VALUE AS HOTWELL CONDUCTIVITY AND MAY RESULT IN ACTUATION OF THE LOCAL ALARM FOR HIGH CONDUCTIVITY AT 1.0 MICRO-MHOS/CM CAUSING ACTUATION OF THE TROUBLE ANNUNCIATOR.

AT INTERMEDIATE SEVERITIES THE ION EXCHANGE CAPACITY WILL BE REDUCED TO THE SPECIFIED VALUE AND WILL CONTINUE TO DEPLETE NORMALLY FROM THAT POINT. MALFUNCTION SEVERITIES LESS THAN THE ACTUAL DEPLETION WILL HAVE NO EFFECT.

CONTROL PANEL INDICATIONS:

NONE

ANNUNCIATORS:

CONDENSATE DEMINERALIZER TROUBLE	CRP 906 A2-1 (4-3)

FURTHER INDICATIONS MAY BE OBSERVED IN INCREASED CONDUCTIVITY IN THE REACTOR VESSEL, AND POSSIBLY INCREASING CONDUCTIVITY IN THE CONDENSATE STORAGE TANK OVER A LONG PERIOD OF TIME.

REMOVAL OF THE MALFUNCTION WILL LEAVE THE ION EXCHANGE

FW04

EFFICIENCY AT ITS PRESENT VALUE. THE RESIN MAY BE REGENERATED BY TAKING THE DEMINERALIZER OFF LINE USING REMOTE FUNCTION FWR15.

B-G -- SIMILAR TO MALFUNCTION A EXCEPT THE AFFECTED COMPONENT WILL BE THE SPECIFIED DEMINERALIZER.

REF: P&ID 26013
CWD 1012
OP 315/515

FW05 CONDENSATE STORAGE TANK LEAK

VARIABLE (100% = 10,000 GPM)

- CST LEAK

TYPE: VARIABLE (100% = 10,000 GPM)

CAUSE: HOLE IN THE BOTTOM OF THE TANK

PLANT STATUS: 100%

EFFECTS: THE CONDENSATE STORAGE TANK WILL DRAIN AT THE RATE OF 10,000 GPM (WHEN AT NORMAL OPERATING LEVEL). WHEN LEVEL DECREASES BELOW 235,000 GALLONS (51%) THE LOW LEVEL ANNUNCIATOR WILL ACTUATE. WHEN LEVEL DECREASES TO ZERO THE CONTROL ROD DRIVE PUMPS, CORE SPRAY PUMPS, AND LPCI PUMPS WILL LOSE SUCTION IF ALIGNED TO THE CST. THE CONDENSATE MAKEUP LINE WILL LOSE SUCTION AND, IF MAKEUP FLOW IS PRESENT, BEGIN DRAWING AIR INTO THE MAIN CONDENSER. THIS WILL RESULT IN DECREASING MAIN CONDENSER VACUUM, INCREASED NON-CONDENSIBLE FLOW TO THE OFFGAS SYSTEM, INCREASING HOTWELL CONDUCTIVITY, AND INCREASED HOTWELL TEMPERATURE.

IF THE CONTROL ROD DRIVE PUMP SUCTION IS ALIGNED TO THE REJECT LINE, IT WILL ONLY LOSE SUCTION IF REJECT FLOW IS LESS THAN CRD SYSTEM DEMAND.

NOTE: NO CREDIT IS TAKEN FOR THE MOTE AROUND THE CST, ALL WATER IS ASSUMED TO BE LOST.

REMOVAL OF THE MALFUNCTION WILL STOP THE LEAK.

CONTROL PANEL INDICATION:

CST LEVEL INDICATOR

ANNUNCIATORS:

CONDENSATE STORAGE TK LEVEL HI/LO	CRP 906 A2-1 (2-3)

REF: P&ID 26018
CWD
OP 315.PA

NOTE: THIS MALFUNCTION NOT CERTIFIED

FW06 SPARE

FW07 LOSS OF CONDENSATE PUMP BREAKER CONTROL POWER

A - CONDENSATE PUMP A LOSS OF CONTROL POWER

B - CONDENSATE PUMP B LOSS OF CONTROL POWER

C - CONDENSATE PUMP C LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES

PLANT STATUS: 100%

EFFECTS: A -- BOTH CLOSED AND OPEN INDICATION WILL BE LOST FOR CONDENSATE PUMP "A". THE BREAKER WILL NOT TRIP, AND WILL NOT BE ABLE TO BE TRIPPED BECAUSE THE TRIP COIL CANNOT BE ENERGIZED. NO OTHER INDICATIONS WILL BE OBSERVED. THE PUMP CURRENT WILL CONTINUE TO INDICATE NORMAL RUNNING CURRENT.

IF, WHILE THIS MALFUNCTION IS ACTIVE, THE CONTROL SWITCH IS PLACED IN THE NORMAL-AFTER-TRIP POSITION, AND THE MALFUNCTION IS SUBSEQUENTLY REMOVED, NO INDICATIONS WILL BE OBSERVED; HOWEVER, IF MALFUNCTION FW01 IS ACTIVATED, THE "CONDENSATE PUMP A, B, OR C TRIP" ANNUNCIATOR WILL NOT ACTUATE.

IF FW01 IS ACTIVATED WHILE THIS MALFUNCTION IS ACTIVE, THE BREAKER WILL NOT TRIP AND THE OVERCURRENT WILL BE SEEN BY THR 4160 V BUS CAUSING ITS SUPPLY BREAKER TO TRIP ON OVERCURRENT. THIS WILL RESULT IN LOSS OF POWER TO ALL COMPONENTS SUPPLIED FROM THAT BUS.

IF ACTIVATED WHEN THE PUMP IS NOT RUNNING, THE PUMP WILL NOT START IN RESPONSE TO FWCI INITIATION. ALSO, THE "A, B, OR C TRIP" ANNUNCIATOR WILL ACTUATE IF THIS MALFUNCTION IS REMOVED WITH THE CONTROL SWITCH IN THE NORMAL-AFTER-CLOSE POSITION.

B -- SIMILAR TO MALF A, BUT THE AFFECTED COMPONENT WILL BE CONDENSATE PUMP B.

C -- SIMILAR TO MALF A, BUT THE AFFECTED COMPONENT WILL BE CONDENSATE PUMP C.

REF: P&ID 26013
CWD 356
OP 314

FW08 LOSS OF CONDENSATE BOOSTER PUMP BREAKER CONTROL POWER

A - COND BOOSTER PUMP A LOSS OF CONTROL PWR

B - COND BOOSTER PUMP B LOSS OF CONTROL PWR

C - COND BOOSTER PUMP C LOSS OF CONTROL PWR

TYPE: GENERIC

CAUSE: BLOWN FUSES

PLANT STATUS: 100%

EFFECTS: A -- BOTH CLOSED AND OPEN INDICATION WILL BE LOST FOR CONDENSATE BOOSTER PUMP "A". THE BREAKER WILL NOT TRIP, AND WILL NOT BE ABLE TO BE TRIPPED BECAUSE THE TRIP COIL CANNOT BE ENERGIZED. NO OTHER INDICATIONS WILL BE OBSERVED. THE PUMP CURRENT WILL CONTINUE TO INDICATE NORMAL RUNNING CURRENT.

IF, WHILE THIS MALFUNCTION IS ACTIVE, THE CONTROL SWITCH IS PLACED IN THE NORMAL-AFTER-TRIP POSITION, AND THE MALFUNCTION IS SUBSEQUENTLY REMOVED, NO INDICATIONS WILL BE OBSERVED; HOWEVER,IF MALFUNCTION FW02 IS ACTIVATED, THE "CONDENSATE BOOSTER PUMP A, B, OR C TRIP" ANNUNCIATOR WILL NOT ACTUATE.

IF FW02 IS ACTIVATED WHILE THIS MALFUNCTION IS ACTIVE, THE BREAKER WILL NOT TRIP AND THE OVERCURRENT WILL BE SEEN BY THE 4160 V BUS CAUSING ITS SUPPLY BREAKER TO TRIP ON OVERCURRENT. THIS WILL RESULT IN LOSS OF POWER TO ALL COMPONENTS SUPPLIED FROM THAT BUS.

IF ACTIVATED WHEN THE PUMP IS NOT RUNNING, THE PUMP WILL NOT START IN RESPONSE TO FWCI INITIATION. ALSO, THE "A, B, OR C TRIP" ANNUNCIATOR WILL ACTUATE IF THIS MALFUNCTION IS REMOVED WITH THE CONTROL SWITCH IN THE NORMAL-AFTER-CLOSE POSITION.

REMOVAL OF THE MALFUNCTION WILL RESTORE CONTROL POWER.

B -- SIMILAR TO MALF A, BUT THE AFFECTED COMPONENT WILL BE CONDENSATE BOOSTER PUMP B.

C -- SIMILAR TO MALF A, BUT THE AFFECTED COMPONENT WILL BE CONDENSATE BOOSTER PUMP C.

FW08

REF:	P&ID	26013
	CWD	356
	OP	314

FW09 HEATER DRAIN PUMP TRIP

A - HEATER DRAIN PUMP A TRIP

B - HEATER DRAIN PUMP B TRIP

C - HEATER DRAIN PUMP C TRIP

TYPE: GENERIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: 100% POWER

EFFECTS: A -- HEATER DRAIN PUMP "A" WILL TRIP DUE TO OPERATION OF THE DEVICE 49 CONTACTS. BOTH INDICATING LAMPS WILL BE DEENERGIZED. LEVEL IN THE L.I.P. HEATERS WILL INCREASE CAUSING THE LEVEL CONTROL VALVES TO OPEN.

L.I.P. HEATER LEVEL WILL INCREASE AND THE EMERGENCY DRAIN WILL OPEN TO THE CONDENSER. THIS WILL ALLOW WATER TO BE VACUUM DRAGGED THROUGH THE DRAIN PUMP TO THE MAIN CONDENSER AND LEVEL WILL STABILIZE ABOVE THE EMERGENCY LEVEL CONTROL VALVE SETPOINT. AS THE DRAIN FLOW BYPASSES THE LP HEATERS, A SMALL REDUCTION IN CONDENSATE HEATING MAY BE OBSERVED.

REMOVAL OF THE MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE (49) USING REMOTE FUNCTION EDR17 WILL ALLOW NORMAL OPERATION OF THE PUMP.

B -- SIMILAR TO MALF A, EXCEPT THE AFFECTED COMPONENT WILL BE HEATER DRAIN PUMP "B".

C -- SIMILAR TO MALF A, EXCEPT THE AFFECTED COMPONENT WILL BE HEATER DRAIN PUMP "C".

REF: P&ID 26014
CWD 380
OP 348

FW10 SPARE

FW11 LP FW HEATER NORMAL LEVEL CONTROLLER FAILURE

VARIABLE (100% = VALVE FULLY OPEN)

A - LP HTR 1A NORM LVL CONT FAIL

B - LP HTR 1B NORM LVL CONT FAIL

C - LIP HTR 2A NORM LVL CONT FAIL

D - LIP HTR 2B NORM LVL CONT FAIL

E - IP HTR 3A NORM LVL CONT FAIL

F - IP HTR 3B NORM LVL CONT FAIL

TYPE: GENERIC, VARIABLE (100% = VALVE FULLY OPEN)

CAUSE: FAILURE OF THE E/P CONVERTER

PLANT STATUS: 100% POWER

EFFECTS: A -- THE L.P. HEATER NORMAL LEVEL CONTROL VALVE WILL GO TO THE INSTRUCTOR SPECIFIED POSITION DUE TO FAILURE OF THE PNEUMATIC SIGNAL.

IF THE VALVE OPENS TO MORE THAN THAT REQUIRED FOR NORMAL FLOW, THE L.P. HEATER LEVEL WILL BEGIN DECREASING.

THE LOW LEVEL ANNUNCIATOR WILL EVENTUALLY ACTUATE WHEN LEVEL DECREASES BELOW 3 INCHES. WHEN THE HEATER DRAINS COMPLETELY, THE HEAT TRANSFERRED TO THE CONDENSATE SYSTEM WILL BE REDUCED DUE TO STEAM BLOWING BY INTO THE MAIN CONDENSER WITHOUT BEING CONDENSED IN THE HEATER. HEATER DRAIN TEMPERATURE WILL INCREASE TO SATURATION TEMPERATURE FOR THE SAME REASON.

IF THE VALVE CLOSES TO LESS THAN REQUIRED FOR NORMAL FLOW, THE L.P. HEATER LEVEL WILL BEGIN INCREASING. THE EMERGENCY LEVEL CONTROL VALVE WILL BEGIN TO OPEN AND WILL CONTROL LEVEL AT ITS SETPOINT. NO OTHER INDICATIONS WILL BE SEEN.

NORMAL REMOVAL OF THIS MALFUNCTION WILL RESTORE VALVE OPERATION.

ANNUNCIATORS:

HEATER LEVEL HI/LO	CRP 906 A1-2
CRP 923 ANNUNCIATOR	(4-6)

FW11

LP HEATER "A" CRP 923
LEVEL LOW (5-4)

B -- SIMILAR TO MALF A EXCEPT THE AFFECTED COMPONENT WILL BE L.P. HEATER B.

C-F SIMILAR TO MALF A EXCEPT THE AFFECTED COMPONENTS WILL BE L.I.P. OR I.P. HEATERS. THE EFFECTS WILL ALSO BE OBSERVED IN THE CASCADING DRAIN FLOWS AND HEATER DRAIN TANK LEVEL.

REF: P&ID 26104
CWD 387
OP 348

FW12 LP FW HEATER EMERGENCY LEVEL CONTROLLER FAILURE

VARIABLE (100% = VALVE FULLY OPEN)

A - LP HTR 1A EMERG LVL CONT FAIL

B - LP HTR 1B EMERG LVL CONT FAIL

C - LIP HTR 2A EMERG LVL CONT FAIL

D - LIP HTR 2B EMERG LVL CONT FAIL

E - IP HTR 3A EMERG LVL CONT FAIL

F - IP HTR 3B EMERG LVL CONT FAIL

TYPE: GENERIC, VARIABLE (100% = VALVE FULLY OPEN)

CAUSE: FAILURE OF THE E/P CONVERTER

PLANT STATUS: 100% POWER

EFFECTS: A -- THE EMERGENCY LEVEL CONTROL VALVE WILL GO TO THE INSTRUCTOR SPECIFIED POSITION DUE TO FAILURE OF THE PNEUMATIC SIGNAL.

AS THE VALVE OPENS, THE NORMAL LEVEL CONTROL VALVE WILL CLOSE DUE TO DECREASING LEVEL IN THE HEATER. IF THE EMERGENCY VALVE OPENS BEYOND THE POINT THAT SHUTS THE NORMAL VALVE FULLY, THE LEVEL WILL DECREASE AND THE LOW LEVEL ANNUNCIATOR WILL EVENTUALLY ACTUATE WHEN LEVEL DECREASES BELOW 3 INCHES. WHEN THE HEATER DRAINS COMPLETELY, THE HEAT TRANSFERRED TO THE CONDENSATE SYSTEM WILL BE REDUCED DUE TO STEAM BLOWING BY INTO THE MAIN CONDENSER WITHOUT BEING CONDENSED IN THE HEATER. HEATER DRAIN TEMPERATURE WILL INCREASE TO SATURATION TEMPERATURE FOR THE SAME REASON.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL VALVE OPERATION.

ANNUNCIATORS:

HEATER LEVEL HI/LO CRP 923 ANNUNCIATOR	CRP 906 A1-2 (4-(
LP HEATER "A" LEVEL LOW	CRP 923 (5-4)

B -- SIMILAR TO MALF A, EXCEPT THE AFFECTED COMPONENT WILL BE LP HEATER B EMERGENCY LEVEL CONTROL VALVE.

FW12

C-F SIMILAR TO MALF A, EXCEPT THE AFFECTED COMPONENTS WILL BE THE L.I.P. AND I.P. HEATERS. ADDITIONAL EFFECTS WILL BE OBSERVED IN THE CASCADING DRAIN FLOWS.

REF: P&ID 26104
CWD 387
OP 348

FW13 HP FW HEATER NORMAL LEVEL CONTROLLER FAILURE

VARIABLE (100% = VALVE FULLY OPEN)

A - HP HTR 5A NORM LVL CONT FAIL

B - HP HTR 5B NORM LVL CONT FAIL

C - HIP HTR 4A NORM LVL CONT FAIL

D - HIP HTR 4B NORM LVL CONT FAIL

TYPE: GENERIC, VARIABLE (100% = VALVE FULLY OPEN)

CAUSE: FAILURE OF CONTROLLER OUTPUT I/P CONVERTER

PLANT STATUS: 100%

EFFECTS: A -- THE NORMAL LEVEL CONTROL VALVE WILL GO TO THE INSTRUCTOR SPECIFIED POSITION DUE TO FAILURE OF THE PNEUMATIC POSITION CONTROLLER.

IF THE VALVE OPENS TO MORE THAN THAT REQUIRED FOR NORMAL FLOW, THE H.P. HEATER LEVEL WILL BEGIN DECREASING. THE LOW LEVEL ANNUNCIATOR WILL EVENTUALLY ACTUATE WHEN LEVEL DECREASES BELOW 4 INCHES. WHEN THE HEATER DRAINS COMPLETELY, THE HEAT TRANSFERRED TO THE FEEDWATER SYSTEM WILL BE REDUCED DUE TO STEAM BLOWING BY INTO THE THE NEXT HEATER (HIP) WITHOUT BEING CONDENSED IN THE HP. HEATER DRAIN TEMPERATURE WILL INCREASE TO SATURATION TEMPERATURE FOR THE SAME REASON. THE STEAM FLOW WILL ALSO BE SEEN IN THE H.I.P. HEATER TEMPERATURE EFFECTS, AND POSSIBLY INTO THE I.P. HEATER. FEEDWATER TEMPERATURE OUT OF THE H.P. HEATER WILL DECREASE SOMEWHAT AS THE HEATER IS DRAINED.

IF THE VALVE CLOSES TO LESS THAN REQUIRED FOR NORMAL FLOW, THE H.P. HEATER LEVEL WILL BEGIN INCREASING. THE EMERGENCY LEVEL CONTROL VALVE WILL BEGIN TO OPEN AND WILL CONTROL LEVEL AT ITS SETPOINT. THE HEATING EFFECTS IN THE H.I.P. HEATER WILL BE REDUCED DUE TO THE FLOW BEING BYPASSED TO THE MAIN CONDENSER.

CONTROL PANEL INDICATION:

FEEDWATER TEMPERATURE DECREASES

ANNUNCIATORS:

HEATER LEVEL HI/LO CRP 906 A1-2
CRP 923 ANNUNCIATOR (4-6)

FW13

HP HEATER "A"	CRP 923
LEVEL LOW	(1-2)

B-D EFFECTS SIMILAR TO MALF A.

REF: P&ID 26104
CWD 387
OP 348

FW14 HP FW HEATER EMERGENCY LEVEL CONTROLLER FAILURE

VARIABLE (100% = VALVE FULLY OPEN)

A - HP HTR 5A EMERG LVL CONT FAIL

B - HP HTR 5B EMERG LVL CONT FAIL

C - HIP HTR 4A EMERG LVL CONT FAIL

D - HIP HTR 4B EMERG LVL CONT FAIL

TYPE: GENERIC, VARIABLE (100% = VALVE FULLY OPEN)

CAUSE: FAILURE OF CONTROLLER OUTPUT I/P CONVERTER

PLANT STATUS: 100%

EFFECTS: A -- THE EMERGENCY LEVEL CONTROL VALVE WILL GO TO THE INSTRUCTOR SPECIFIED POSITION DUE TO FAILURE OF THE PNEUMATIC POSITION CONTROLLER.

AS THE VALVE OPENS, THE NORMAL LEVEL CONTROL VALVE WILL CLOSE DUE TO DECREASING LEVEL IN THE HEATER. IF THE EMERGENCY VALVE OPENS BEYOND THE POINT WHICH WOULD SHUT THE NORMAL VALVE FULLY, AS LEVEL DECREASES THE LOW LEVEL ANNUNCIATOR WILL EVENTUALLY ACTUATE WHEN LEVEL DECREASES BELOW 4 INCHES. WHEN THE HEATER DRAINS COMPLETELY, THE HEAT TRANSFERRED TO THE FEEDWATER SYSTEM WILL BE REDUCED DUE TO STEAM BLOWING BY INTO THE MAIN CONDENSER WITHOUT BEING CONDENSED IN THE HEATER. HEATER DRAIN TEMPERATURE WILL INCREASE TO SATURATION TEMPERATURE FOR THE SAME REASON.

REMOVAL OF THE MALFUNCTION WILL RESTORE NORMAL VALVE OPERATION.

ANNUNCIATORS:

HEATER LEVEL HI/LO CRP 923 ANNUNCIATOR	CRP 906 A1-2 (4-6)
HP HEATER "A" LEVEL LOW	CRP 923 (1-2)

B-D SIMILAR TO MALF A.

REF: P&ID 26104
CWD 387
OP 348

FW15 RFP MINIMUM FLOW RECIRC VALVE FAILS OPEN

A - RFP A MIN FLOW RECIRC VALVE FAILS OPEN

B - RFP B MIN FLOW RECIRC VALVE FAILS OPEN

C - RFP C MIN FLOW RECIRC VALVE FAILS OPEN

TYPE: GENERIC

CAUSE: FLOW SWITCH FS-2-1A,-2A, OR -3A FAILS OPEN

PLANT
STATUS: 100% POWER

EFFECTS: A -- IF REACTOR FEED PUMP "A" IS RUNNING, THE MINIMUM FLOW RECIRC VALVE WILL OPEN INCREASING FLOW THROUGH THE PUMP BY ABOUT 2000 GPM. FEED FLOW TO THE REACTOR WILL DECREASE AND THE FEED REG VALVES WILL OPEN TO ATTEMPT TO CONTROL VESSEL LEVEL.

IF THE MINIMUM FLOW RECIRC VALVE IS ALREADY OPEN, NO EFFECTS WILL BE SEEN DUE TO THIS MALFUNCTION.

PLACING THE MINIMUM FLOW VALVE CONTROL SWITCH TO CLOSE OR AN AUTO CLOSE SIGNAL DURING A FWCI INITIATION WILL STILL CLOSE THE VALVE, REGARDLESS OF THIS MALFUNCTION.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF FS-2-1A.

CONTROL ROOM INDICATIONS:

RFP SUCTION FLOW

FEEDWATER FLOW CONTROL VALVE POSITIONS

REACTOR WATER LEVEL

ANNUNCIATORS:

NONE

B-C SIMILAR TO MALF A.

REF: P&ID 26013
CWD 341
OP 316

FW16 SPARE

FW17 FEEDWATER PUMP TRIP

A - RFP A TRIP

B - RFP B TRIP

C - RFP C TRIP

TYPE: GENERIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: 100%, A & B RFP'S RUNNING, C IN STANDBY

EFFECTS: A -- FEED PUMP A MOTOR WILL SHORT CAUSING ACTIVATION OF THE INSTANTANEOUS OVERCURRENT TRIP DEVICE (50). THE BREAKER WILL TRIP.

CONTROL PANEL INDICATIONS:

PUMP CURRENT SPIKE

FEED PUMP DISCHARGE PRESSURE DECREASES

ANNUNCIATORS:

REACTOR FEED PUMP A OVERLOAD OR FAULT TRIP	CRP 906 A1-1 (3-1)

THE STANDBY REACTOR FEEDPUMP WILL START AUTOMATICALLY. AS THE PUMP COMES UP TO SPEED AND THE ATTACHED OIL PUMP PRODUCES GREATER THAN 13 PSIG, THE GREEN LIGHT WILL GO OUT AND THE AUXILIARY OIL PUMP WILL STOP. AS THE "A" FEEDPUMP COASTS DOWN, ITS AUXILIARY OIL PUMP WILL START WHEN THE ATTACHED OIL PUMP PRESSURE DROPS BELOW 7 PSIG.

REACTOR WATER LEVEL WILL EXHIBIT A TRANSIENT, HOWEVER MOST OF THE TRANSIENT WILL BE DAMPED BY THE LEVEL CONTROL SYSTEM. THE FEEDWATER CONTROL VALVES WILL BEGIN OPENING AS THE LEVEL DECREASES DUE TO THE TRIPPED PUMP. AS THE STANDBY PUMP COMES UP TO PRESSURE IT WILL BEGIN FEEDING AT AN INCREASED RATE AND LEVEL WILL RECOVER RAPIDLY.

REMOVAL OF THE MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR 17 WILL ALLOW NORMAL OPERATION OF THE PUMP.

B -- SIMILAR TO MALF A EXCEPT FEED PUMP B IS THE AFFECTED COMPONENT.

C -- NO EFFECTS WILL BE OBSERVED UNLESS THE PUMP RECEIVES

FW17

A START SIGNAL, AT WHICH TIME IT WILL BE AFFECTED IN A SIMILAR MANNER TO MALF A.

REF: P&ID 26013
CWD 368
OP 316

FW18 FEEDWATER PIPE RUPTURE OUTSIDE CONTAINMENT

VARIABLE (100% = 7.6E6 LBM/HR)

- FEEDWATER RUPTURE INSIDE HEATER BAY

TYPE: VARIABLE (100% = 7.6E6 LBM/HR)

CAUSE: PIPE FAILURE

PLANT STATUS: 100%

EFFECTS: THE FEEDWATER HEADER WILL RUPTURE JUST UPSTREAM OF THE POINT WHERE THE HEADER DIVIDES TO THE H.I.P. HEATERS. AT 100% SEVERITY AND NORMAL FEED PRESSURE, FLOW THROUGH THE RUPTURE WILL BE 7.6E6 LBM/HR.

THE RUPTURE WILL CAUSE THE FEEDWATER HEADER PRESSURE TO DROP RAPIDLY TO LESS THAN REACTOR PRESSURE. THE CONTAINMENT ISOLATION CHECK VALVES WILL PREVENT ANY REVERSE FLOW FROM THE REACTOR VESSEL. THE LOSS OF FEED FLOW TO THE VESSEL WILL CAUSE REACTOR WATER LEVEL TO DECREASE, AND THE LEVEL CONTROL SYSTEM WILL ATTEMPT TO RESTORE LEVEL BY OPENING THE FEED CONTROL VALVES. AS FLOW THROUGH THE FEEDPUMPS INCREASES, BOTH SUCTION AND DISCHARGE PRESSURE WILL DECREASE AS THE PUMPS GO INTO RUNOUT. AS SUCTION PRESSURE DECREASE BELOW 335 PSIG THE LOW SUCTION PRESSURE ANNUNCIATOR WILL ACTUATE. IF SUCTION PRESSURE DECREASES BELOW 85 PSIG, THE REACTOR FEED PUMPS WILL TRIP.

THE COMPLETE LOSS OF FEEDWATER FROM 100% POWER WILL RESULT IN A SEVERE TRANSIENT SIMILAR TO THE F.S.A.R. TRANSIENT FOR CLOSURE OF THE FEEDWATER LEVEL CONTROL VALVES. THE REACTOR WILL SCRAM ON LOW LEVEL IN ABOUT 5 SECONDS.

THE WATER LOST THROUGH THE LE, WILL APPEAR IN THE TURBINE BUILDING FLOOR DRAIN SUMP. THE STEAM RELEASED WILL CAUSE ELEVATED TEMPERATURES IN THE AREA OF THE BREAK.

CONTROL PANEL INDICATIONS:

RFP A DISCHG PRESSURE DECREASES

RFP B DISCHG PRESSURE DECREASES

RFP C DISCHG PRESSURE DECREASES

RF WATER PRESS TRAIN A DECREASES

RF WATER PRESS TRAIN B DECREASES

FW18

RFP A SUCTION FLOW INCREASES

RFP B SUCTION FLOW INCREASES

CONDENSATE DEMIN D/P INCREASES

ANNUNCIATORS:

CONDENSATE DEMINERALIZER TROUBLE	CRP 906 A2-1 (4-3)
REACTOR FEED PUMP A SUCTION PRESSURE LOW	CRP 906 A1-1 (7-1)
REACTOR FEED PUMP B SUCTION PRESSURE LOW	CRP 906 A1-1 (7-2)
REACTOR FEED PUMP C SUCTION PRESSURE LOW	CRP 906 A1-1 (7-3)

REF: P&ID 29119 (SH. 248)
CWD 760-785
OP 561B

FW19 FEEDWATER PIPE RUPTURE INSIDE CONTAINMENT

VARIABLE (100% = 7.6E6 LBM/HR)

- FEEDWATER RUPTURE INSIDE CONTAINMENT

TYPE: VARIABLE (100% = 7.6E6 LBM/HR)

CAUSE: PIPE FAILURE

PLANT STATUS: 100%

EFFECTS: THE "A" FEEDWATER HEADER WILL RUPTURE BETWEEN THE INBOARD CHECK VALVE V58A AND THE MANUAL ISOLATION VALVE V57A RESULTING IN AN UNISOLABLE LEAK FROM THE REACTOR PRESSURE VESSEL THROUGH THE FEEDWATER HEADER. FLOW THROUGH THE LEAK WILL BE 7.6E6 LBM/HR AT 100% SEVERITY WITH NORMAL SYSTEM PRESSURE.

THE EFFECTS ON THE FEEDWATER SYSTEM WILL BE SIMILAR TO THOSE OBSERVED IN FW18. THE LOSS OF WATER FROM THE REACTOR VESSEL WILL CAUSE CONTAINMENT PRESSURE AND TEMPERATURE TO RISE. AS THE WATER LEVEL IN THE VESSE DOWNCOMER DECREASES BELOW THE LEVEL OF THE FEEDWATER SPARGERS, THE FLOW FROM THE VESSEL BECOMES STEAM CAUSING THE RATE OF MASS LOSS FROM THE VESSEL TO NOTICEABLY DECREASE AND THE RATE OF VESSEL DEPRESSURIZATION TO NOTICEABLY INCREASE.

THE CONTAINMENT TEMPERATURE AND PRESSURE RESPONSE WILL BE SIMILAR TO THAT DESCRIBED FOR THE MAIN STEAM LINE RUPTURE (MS01), HOWEVER THE TRANSIENT WILL PEAK SOMEWHAT LATER AND NOT BE AS SEVERE. THE LONG TERM TRANSIENT WILL BE NEARLY IDENTICAL.

CONTROL PANEL INDICATIONS:

REACTOR WATER LEVEL

DRYWELL PRESSURE

DRYWELL TEMPERATURE

RFP A DISCHG PRESSURE

RFP B DISCHG PRESSURE

RFP C DISCHG PRESSURE

RF WATER PRESS TRAIN A

RF WATER PRESS TRAIN B

FW19

RFP A SUCTION FLOW

RFP B SUCTION FLOW

CONDENSATE DEMIN D/P

ANNUNCIATORS:

CONDENSATE DEMINERALIZER TROUBLE	CRP 906 A2-1 (4-3)
REACTOR FEED PUMP A SUCTION PRESSURE LOW	CRP 906 A1-1 (7-1)
REACTOR FEED PUMP B SUCTION PRESSURE LOW	CRP 906 A1-1 (7-2)
REACTOR FEED PUMP C SUCTION PRESSURE LOW	CRP 906 A1-1 (7-3)
REACTOR PRESS LOW	CRP 903 A1 (1-4)
DRYWELL HI PRESSURE	CRP 903 A1 (2-3)
DRYWELL FLOOR DPAIN SUMP HI-HI LEVEL	CRP 904 A1 (3-4)

REF: P&ID 29119 (SH 248)
CWD 760-785
OP 516B

FW20 10% FEED VALVE 1-FW-5C CONTROLLER FAILURE

VARIABLE (100% = VALVE FULLY OPEN)

- 10% FEED VALVE CONTROLLER FAILURE

TYPE: VARIABLE (100% = VALVE FULLY OPEN)

CAUSE: FAILURE OF CONTROLLER OUTPUT

PLANT STATUS: 100%

EFFECTS: THE CONTROLLER OUTPUT WILL BE SET TO THE INSTRUCTOR SPECIFIED POSITION (0-100% OPEN). IF THE 10% VALVE BLOCKING VALVE IS OPEN, THEN FEED FLOW TO THE VESSEL WILL INCREASE CAUSING LEVEL TO INCREASE ABOVE THE SETPOINT OF THE LEVEL CONTROL SYSTEM. THE NORMAL LEVEL CONTROL VALVES WILL CLOSE DOWN TO RESTORE LEVEL TO NORMAL. THE INDICATION ON THE MANUAL LOADING STATION FOR THE LOW FLOW VALVE WILL CONTINUE TO INDICATE THE DEMANDED VALVE POSITION, BUT THE VALVE WILL NOT RESPOND.

IF THIS MALFUNCTION IS INSERTED AT LOW POWER OR SHUTDOWN CONDITIONS WHEN THE 10% FEED VALVE IS CONTROLLING LEVEL, THE LEVEL WILL RESPOND ACCORDING TO THE DEVIATION BETWEEN FEED FLOW TO THE VESSEL AND LOSSES FROM THE VESSEL.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE LOW FLOW VALVE TO RESPOND NORMALLY TO THE DEMAND FROM ITS CONTROLLER.

CONTROL PANEL INDICATIONS:

VESSEL LEVEL MASTER CONTROLLER

FEED REG VALVE POSITION

FEEDWATER CONTROLLERS

REF: P&ID 26013
CWD 660
OP 316

FW21 LOSS OF AIR TO FEEDWATER CONTROL VALVE

A - FEED REG VALVE 5A LOSS OF AIR

B - FEED REG VALVE 5B LOSS OF AIR

C - 10% CONTROL VALVE 5C LOSS OF AIR

TYPE: GENERIC

CAUSE: RUPTURED AIR LINE

PLANT STATUS: 100%

EFFECTS: A -- THE VALVE OPERATING AIR LINE WILL RUPTURE BETWEEN THE VALVE CONTROLLER AND THE VALVE
ACTUATOR RESULTING IN A COMPLETE LOSS OF AIR TO THE
VALVE. THE LEVEL CONTROL VALVE WILL REMAIN IN ITS
PRESENT POSITION AND WILL NOT RESPOND TO ANY SIGNALS
FROM THE CONTROL SYSTEM. THE LOSS OF AIR PRESSURE
WILL ACTUATE THE LOCKOUT ANNUNCIATOR AND THE RESET PUSHBUTTON WILL ILLUMINATE.

PRESSING THE RESET PUSHBUTTON WHILE THIS MALFUNCTION IS ACTIVE WILL CAUSE THE LIGHT TO EXTINGUISH, BUT WILL HAVE NO OTHER EFFECTS. THE LIGHT WILL COME BACK ON WHEN THE PUSHBUTTON IS RELEASED.

LEVEL TRANSIENTS WILL BE SLIGHTLY GREATER THAN NORMAL, SINCE THE "B" FEED REG VALVE WILL HAVE TO MOVE TWICE AS MUCH TO GET THE REQUIRED FLOW. IF THE FLOW DEMAND EXCEEDS THE COMBINED CAPACITY OF THE "A" VALVE AT ITS PRESENT POSITION AND THE "B" VALVE AT ITS MAXIMUM POSITION, LEVEL WILL BEGIN TO DECREASE. IF THE FLOW DEMAND DECREASES BELOW THE CAPACITY OF THE "A" VALVE AT ITS PRESENT POSITION, THE "B" VALVE WILL COMPLETELY CLOSE AND LEVEL WILL BEGIN TO INCREASE.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE FEED REG VALVE TO BE RESET BY MEANS OF THE LIGHTED PUSHBUTTON ON CRP 905.

CONTROL PANEL INDICATIONS:

RESET VALVE A LIGHTS

RESET VALVE B LIGHTS

FEEDWATER CONT MAN/AUTO DEVIATION

ANNUNCIATORS:

FW21

FEED REG VALVE A LOCKOUT	CRP 905 A3 (8-1)
FEED REG VALVE B LOCKOUT	CRP 905 A3 (8-2)

B -- SIMILAR TO MALF A, EXCEPT THE AFFECTED COMPONENT WILL BE LEVEL CONTROL VALVE 642B.

C -- THE LOW FLOW CONTROL VALVE WILL FAIL TO THE FULL OPEN POSITION. THE EFFECTS WILL BE SIMILAR TO MALFUNCTION FW20.

REF:

P&ID N/A
CWD 660
OP 316

FW22 FEEDWATER CONTROLLER FAILURE

VARIABLE (100% = VALVE FULL OPEN DEMAND)

A - FEEDWATER CONTROLLER A AUTO FAILURE

B - FEEDWATER CONTROLLER B AUTO FAILURE

TYPE: GENERIC, VARIABLE (100% = VALVE FULL OPEN DEMAND)

CAUSE: FAILURE OF CONTROLLER AUTO OUTPUT

PLANT STATUS: 100%

EFFECTS: A -- THE CONTROLLER AUTO OUTPUT SIGNAL WILL GO TO THE INSTRUCTOR SPECIFIED VALUE AND THE FEEDWATER CONTROL VALVE WILL RESPOND BY MOVING TO THE DEMANDED POSITION.

IF THE VALVE OPENS FROM ITS STEADY STATE POSITION, THE OTHER VALVE WILL CLOSE DOWN AS NECESSARY AS FEED FLOW AND REACTOR LEVEL INCREASE.

IF THE VALVE CLOSES FROM ITS STEADY STATE POSITION, THE OTHER VALVE WILL OPEN IN RESPONSE TO THE DECREASED REACTOR VESSEL LEVEL. SINCE THE CAPACITY OF THE FEEDWATER LEVEL CONTROL VALVES IS ONLY 55% OF RATED FLOW, THE REACTOR WILL NOT GET SUFFICIENT FLOW TO MAINTAIN LEVEL. LEVEL WILL CONTINUE TO DECREASE UNTIL A SCRAM OCCURS DUE TO LOW LEVEL.

PLACING THE CONTROLLER IN MANUAL WILL BLOCK THE AUTO SIGNAL AND ALLOW THE OPERATOR TO POSITION THE FEEDWATER CONTROL VALVE.

REMOVAL OF THE MALFUNCTION WILL RESTORE THE AUTO SIGNAL TO ITS NORMAL VALUE.

B -- SIMILAR TO MALFUNCTION A EXCEPT THE AFFECTED COMPONENT WILL BE FEEDWATER CONTROL VALVE B.

REF: P&ID N/A
CWD 660
OP 316

FW23 FEEDWATER CONTROL VALVE ERRATIC OPERATION

VARIABLE (100% = OSCILLATION OF 50% VALVE POSITION)

A - FEEDWATER CONTROL VALVE A OSCILLATION

B - FEEDWATER CONTROL VALVE B OSCILLATION

TYPE: GENERIC, VARIABLE (100% = OSCILLATION OF 50% VLV POS)

CAUSE: I/P CONVERTER FAILURE

PLANT STATUS: 100%

EFFECTS: A -- THE POSITION DEMAND SIGNAL TO THE A FEEDWATER LEVEL CONTROL VALVE WILL EXHIBIT RANDOM OSCILLATIONS ABOUT THE NORMAL VALUE, WITH A PERIOD OF ABOUT FIVE SECONDS.

AT 100% SEVERITY, THE VALVE WILL SWING FROM ABOUT 50% OPEN TO FULL OPEN. IT WILL REMAIN IN THE FULL OPEN POSITION WHILE THE RANDOM OUTPUT EXCEEDS THE MAXIMUM ALLOWABLE DEMAND.

AS THE VALVE OSCILLATES, FEED HEADER PRESSURES AND FLOWS WILL ALSO OSCILLATE. THE OTHER CONTROL VALVE MAY EXHIBIT OUT-OF-PHASE OSCILLATIONS AS IT RESPONDS TO THE CHANGING LEVEL. THE MALFUNCTIONING VALVE MAY BE DETERMINED BY OBSERVING THE DEVIATION METER. THE AFFECTED VALVE WILL SHOW LARGE CHANGING DEVIATIONS, WHILE THE UNAFFECTED VALVE WILL SHOW ONLY SLIGHT DEVIATION AS IT RESPONDS NORMALLY TO THE AUTOMATIC DEMAND SIGNAL.

REMOVAL OF THE MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE FEEDWATER LEVEL CONTROL VALVE.

B -- SIMILAR TO MALFUNCTION A, EXCEPT THE AFFECTED COMPONENT WILL BE FEEDWATER LEVEL CONTROL VALVE B.

REF: P&ID N/A
CWD 660
OP 316
GEK 27655

FW24 LP FW HEATER TUBE LEAK

VARIABLE (100% = 2.0E5 LBM/HR)

A - LP HTR 1A TUBE LEAK

B - LP HTR 1B TUBE LEAK

C - LIP HTR 2A TUBE LEAK

D - LIP HTR 2B TUBE LEAK

E - IP HTR 3A TUBE LEAK

F - IP HTR 3B TUBE LEAK

TYPE: GENERIC, VARIABLE (100% = 2.0E5 LBM/HR)

CAUSE: TUBE FAILURE

PLANT STATUS: 100%

EFFECTS: A -- AT 100% SEVERITY 2.0E5 LBM/HR WATER WILL LEAK FROM THE CONDENSATE SYSTEM INTO THE LOW PRESSURE HEATER "A".

LEVEL IN THE HEATER WILL INCREASE CAUSING THE NORMAL LEVEL CONTROL VALVE TO OPEN. THE LEAK RATE IS NOT HIGHER THAN THE CAPACITY OF THE NORMAL LEVEL CONTROL VALVE.

REMOVAL OF THE MALFUNCTION WILL STOP THE LEAK.

CONTROL ROOM INDICATIONS:

CONDENSATE PUMP DISCHARGE PRESSURE DECREASES

COND BOOSTER PUMP DISCHG TEMPERATURE DECREASES

COND BOOSTER PUMP DISCHG PRESSURE DECREASES

FEED HEADER TEMPERATURE DECREASES

ANNUNCIATORS:

NONE

B-F -- SIMILAR TO MALF A

REF: P&ID 26014
OP 348

FW25 HP FW HEATER TUBE LEAK

VARIABLE (100% = 5.0E5 LBM/HR)

A - HP HTR 5A TUBE LEAK

B - HP HTR 5B TUBE LEAK

C - HIP HTR 4A TUBE LEAK

D - HIP HTR 4B TUBE LEAK

TYPE: GENERIC, VARIABLE (100% = 5.0E5 LBM/HR)

CAUSE: TUBE FAILURE

PLANT STATUS: 100%

EFFECTS: FEEDWATER WILL LEAK INTO THE H.P. FEED HEATER AT 5.0E5 LMB/HR. LEVEL WILL INCREASE CAUSING THE NORMAL LEVEL CONTROL VALVE TO OPEN. THIS WILL CAUSE LEVEL IN THE H.I.P. HEATER TO ALSO INCREASE. AS LEVEL IN THE H.P. HEATER INCREASES, THE EMERGENCY LEVEL CONTROL VALVE WILL OPEN TO CONTROL LEVEL.

FEEDWATER TEMP WILL DECREASE DUE TO INCREASED HEATER LEVEL.

THE FLOW LOST THROUGH THE HEATER LEAK WILL DECREASE THE FLOW BEING DELIVERED TO THE REACTOR VESSEL UNTIL THE FEED REG VALVES OPEN IN RESPONSE TO A DROPPING LEVEL.

REMOVAL OF THE MALFUNCTION WILL STOP THE LEAK.

CONTROL PANEL INDICATION:

FEED HEADER TEMPERATURE

ANNUNCIATORS:

HP HTR 'A' LEVEL HIGH	CRP 923 (1-1)
HP HTR 'B' LEVEL HIGH	CRP 923 (1-2)
HEATER LEVEL HI/LO CRP 923 ANNUNCIATOR	CRP 906 A1-2 (4-6)

REF: P&ID 26014
CWD 387
OP 348

FW26 FWCI AUTO START FAILURE

- FWCI AUTO START FAILURE

TYPE: SPECIFIC

CAUSE: BLOWN FUSE XD3 IN THE FWCI STARTING CIRCUIT

PLANT STATUS: HOT STANDBY

EFFECTS: NO IMMEDIATE EFFECTS WILL BE OBSERVED. IF LO-LO REACTOR WATER LEVEL OR HIGH DRYWELL PRESSURE CAUSE ACTIVATION OF ECCS SYSTEMS SUCH THAT FWCI SHOULD INITIATE, NO AUTOMATIC FWCI ACTIONS WILL OCCUR.

REMOVAL OF THE MALFUNCTION WILL ALLOW NORMAL OPERATION OF THE CIRCUIT.

CONTROL ROOM INDICATIONS:

CONDENSATE PUMP DOES NOT START

CONDENSATE BOOSTER PUMP DOES NOT START

REACTOR FEED PUMP DOES NOT START

FWCI EMERGENCY CONDENSATE TRANSFER PUMP DOES NOT START

CONDENSATE TO OFFGAS CONDENSER VALVES DOES NOT CLOSE

SJAE MIN FLOW RECIRC DOES NOT CLOSE

FEED REG VALVE BLOCKING VALVES DO NOT OPEN AND THE 10% BLOCKER DOES NOT CLOSE

REF: P&ID 26013
CWD 325
OP 334

FW27 FWCI CONDENSATE TRANSFER PUMP TRIP

- FWCI COND TRANSFER PUMP TRIP

TYPE: SPECIFIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: HOT STANDBY

EFFECTS: NO EFFECTS WILL BE OBSERVED UNTIL THE PUMP RECEIVES A START SIGNAL, EITHER FROM FWCI INITIATION OR MANUALLY.

WHEN STARTED, OR IF ALREADY RUNNING, THE PUMP WILL TRIP DUE TO ACTIVATION OF THE INSTANTANEOUS OVERCURRENT TRIP DEVICE (50). THE PUMP WILL INDICATE STOPPED AT THE CONTROL SWITCH.

THE PUMP DISCHARGE VALVE 1-MW-96A WILL CYCLE FULLY OPEN AND THEN CLOSE. WHILE THE VALVE IS NOT CLOSED, WATER WILL FLOW THROUGH THE PUMP DUE TO THE WATER HEAD AND DIFFERENTIAL PRESSURE. THIS FLOW MAY BE SEEN AS DECREASING CST LEVEL AND INCREASING HOTWELL LEVEL.

ATTEMPTING TO RESTART THE PUMP AFTER THE START SIGNAL HAS CLEARED WILL CAUSE THE BREAKER TO CLOSE AND TRIP AGAIN. THE DISCHARGE VALVE WILL CYCLE FULLY OPEN AND THEN CLOSE.

REMOVAL OF THE MALFUNCTION WILL ALLOW NORMAL OPERATION OF THE PUMP.

CONTROL ROOM INDICATIONS:

FWCI CONDENSATE TRANSFER PUMP STATUS

FWCI CONDENSATE PUMP DISCH VLV STATUS

ANNUNCIATORS:

EMERGENCY CONDENSATE TRANSFER PUMP 1C OVERLOAD OR TRIP	CRP 906 A1-1 (4-2)

REF: P&ID 26018
CWD 335
OP 334

FW23 FWCI CONDENSATE TRANSFER PP DISCH VLV 1-MW-96A BINDS

VARIABLE (0-100% VALVE POSITION)

- FWCI COND XFER PP DISCHARGE VALVE BINDS

TYPE: VARIABLE (0-100% VALVE POSITION)

CAUSE: MECHANICAL BINDING CAUSES VALVE MOTOR TO TRIP

PLANT STATUS: 100% POWER

EFFECTS: WHEN THE FWCI CONDENSATE TRANSFER PUMP IS STARTED OR STOPPED, THE DISCHARGE VALVE OPENS OR CLOSES, RESPECTIVELY. WHEN THE VALVE PASSES THROUGH THE INSTRUCTOR SPECIFIED POSITION, IT WILL BIND AND TRIP ON OVERLOAD CAUSING ACTUATION OF DEVICE 49. THE VALVE POSITION LIGHTS WILL GO OUT AND THE VALVE WILL REMAIN AT ITS PRESENT POSITION.

IF NOT FULLY CLOSED, FLOW WILL PASS THROUGH THE VALVE DEPENDING ON VALVE POSITION, THE HEAD OF WATER, THE CST, THE FWCI CONDENSATE TRANSFER PUMP DISCHARGE PRESSURE, AND CONDENSER VACUUM. THIS FLOW WILL BE SEEN THROUGH DECREASING CST LEVEL AND INCREASING HOTWELL LEVEL.

REMOVAL OF THE MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESET THE BREAKER AND ALLOW NORMAL OPERATION OF THE VALVE.

REF: P&ID 26018
CWD 332
OP 334

FW29 LOSS OF FEEDWATER PUMP BREAKER CONTROL POWER

A - RFP A LOSS OF CONTROL POWER

B - RFP B LOSS OF CONTROL POWER

C - RFP C LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES FU/15 AND FU/35

PLANT STATUS: 100%

EFFECTS: A -- THE PUMP BREAKER STATUS LIGHTS WILL BOTH GO OUT, BUT THE PUMP WILL CONTINUE RUNNING AS INDICATED BY PUMP CURRENT, DISCHARGE PRESSURE, AND FLOWS. NO SIGNAL WILL CAUSE THE PUMP TO TRIP.

REMOVAL OF THE MALFUNCTION WILL RESTORE CONTROL POWER.

IF ANY TRIP SIGNALS ARE PRESENT, THE PUMP WILL TRIP.

B -- SIMILAR TO MALF A EXCEPT THE AFFECTED COMPONENT WILL BE FEED PUMP B.

C -- THE PUMP BREAKER STATUS LIGHTS WILL BOTH GO OUT. THE PUMP WILL NOT RESPOND TO ANY START SIGNAL, AS INDICATED BY PUMP CURRENT AND DISCHARGE PRESSURE.

REMOVAL OF THE MALFUNCTION WILL RESTORE CONTROL POWER.

IF ANY START SIGNALS ARE PRESENT, THE PUMP WILL START.

ANNUNCIATORS:

NONE

REF: P&ID 26013
CWD 358
OP 316

FW30 MAIN CONDENSER AIR INLEAKAGE

VARIABLE (100% = 1000 SCFM)

A - MAIN CONDENSER A AIR INLEAKAGE

B - MAIN CONDENSER B AIR INLEAKAGE

TYPE: GENERIC, VARIABLE (100% = 1000 SCFM)

CAUSE: EXPANSION BOOT FAILURE

PLANT STATUS: 100%

EFFECTS: A -- AT 100% SEVERITY WITH NORMAL CONDENSER VACUUM, 1000 SCFM AIR WILL ENTER THE "A" MAIN CONDENSER. VACUUM WILL BEGIN TO DECREASE AND THE EFFECTS WILL BE SEEN IN GENERATOR OUTPUT DECREASING. THE PRESSURE IN THE "B" CONDENSER WILL ALSO BEGIN DECREASING SINCE THE CONDENSERS ARE CONNECTED BY AN EQUALIZING LINE.

THE AIR IN THE CONDENSER WILL BE DRAWN INTO THE STEAM JET AIR EJECTORS AND WILL BE SEEN AS INCREASING FLOW IN THE OFFGAS SYSTEM.

HOTWELL TEMPERATURE WILL BEGIN INCREASING BECAUSE OF THE HIGHER SATURATION PRESSURE. HOTWELL CONDUCTIVITY AND DISSOLVED OXYGEN WILL BEGIN INCREASING.

REMOVAL OF THE MALFUNCTION WILL STOP THE LEAK.

CONTROL PANEL INDICATION:

CONDENSER VACUUM RCDR

CONDENSER VACUUM METER

SJAE EXHAUST FLOW RCDR

CONDENSER CONDUCTIVITY RCDR

GENERATED POWER

COND PUMP DISCHG TEMP

ANNUNCIATORS:

25" TURBINE CONDENSER VACUUM LOW	CRP 907 A1-2 (2-6)
24.9" CONDENSER LOW VACUUM ALARM	CRP 905 A-2 (2-3)

FW30

23"	CONDENSER LO VACUUM	CRP 905 A-2 (5-4)
22.5"	TURBINE CONDENSER LOW VACUUM TRIP	CRP 907 A1-2 (1-6)
7"	BYPASS /ALVE 'RIP	(LATER)

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE INTEGRITY OF THE BOOT AND ALLOW NORMAL VACUUM TO BE RESTORED.

B -- SIMILAR TO MALF A, EXCEPT THE AFFECTED COMPONENT WILL BE MAIN CONDENSER "B".

REF: P&ID 26011
CWD 71
OP 314

FW31 MAIN CONDENSER LEVEL CONTROL FAILURE

VARIABLE (0-70 IN. INDICATED HOTWELL LEVEL)

A - MAIN COND A LEVEL CONTROLLER FAILURE

B - MAIN COND B LEVEL CONTROLLER FAILURE

TYPE: GENERIC, VARIABLE (0-70 IN. INDICATED HOTWELL LEVEL)

CAUSE: LEVEL TRANSMITTER FAULT

PLANT STATUS: 100% (HOTWELL CONTROLLER A SELECTED)

EFFECTS: A -- IF THE MALFUNCTION SET THE INDICATED HOTWELL LEVEL ABOVE THE HOTWELL LEVEL CONTROLLER SETPOINT THE CONDENSATE MAKE-UP VALVE WILL CLOSE AND THE CONDENSATE DUMP VALVE WILL OPEN ALLOWING WATER TO BE REJECTED TO THE CST. ACTUAL HOTWELL LEVEL WILL BEGIN TO DECREASE.

WHEN LEVEL DECREASES BELOW 34 INCHES, THE HOTWELL LOW LEVEL ANNUNCIATOR WILL ACTUATE. WHEN LEVEL DECREASES BELOW 12 INCHES, THE CONDENSATE PUMPS WILL TRIP, FOLLOWED BY TRIPS OF THE CONDENSATE BOOSTER PUMPS AND REACTOR FEED PUMPS. REACTOR SCRAM WILL OCCUR DUE TO LOW REACTOR WATER LEVEL.

IF THE MALFUNCTION SETS THE INDICATED HOTWELL LEVEL BELOW THE HOTWELL LEVEL CONTROLLER SETPOINT,
THE DUMP VALVE WILL CLOSE AND THE MAKE-UP VALVE WILL OPEN ALLOWING WATER TO BE TRANSFERRED FROM THE CST. ACTUAL HOTWELL LEVEL WILL BEGIN INCREASING.

WHEN LEVEL INCREASES ABOVE 60 INCHES, THE HOTWELL HI LEVEL ANNUNCIATOR WILL ACTUATE. AS LEVEL INCREASES INTO THE TUBE REGION OF THE CONDENSER, CONDENSATE TEMPERATURE WILL DECREASE DUE TO CHANGING STEAM FLOWS WITHIN THE CONDENSER. CONDENSER VACUUM WILL BEGIN DECREASING DUE TO THE DECREASED TUBE AREA AVAILABLE TO CONDENSE THE TURBINE EXHAUST. THE TURBINE WILL EVENTUALLY TRIP ON LOW CONDENSER VACUUM.

AT ANY TIME DURING THE MALFUNCTION, THE OPERATOR MAY SELECT CHANNEL B FOR HOTWELL LEVEL CONTROL. THIS WILL ALLOW ACTUAL LEVEL TO REVERSE THE TRANSIENT AND RECOVER CONTROL OF HOTWELL LEVEL. THE CONTROLLER MAY ALSO BE PUT IN MANUAL, HOWEVER THIS WILL
NOT ALLOW ACTUAL HOTWELL LEVEL TO BE SEEN.

REMOVAL OF THE MALFUNCTION WILL RESTORE THE LEVEL SIGNAL TO ITS ACTUAL VALUE.

FW31

CONTROL ROOM INDICATIONS:

CONDENSER HOTWELL LEVEL RECORDER AND CONTROLLER DEVIATION

CONDENSATE STORAGE TANK LEVEL

CONDENSATE PUMP DISCHARGE TEMPERATURE

CONDENSATE DUMP FLOW (PPC)

CONDENSATE DEMIN. DIFFERENTIAL PRESSURES

ANNUNCIATORS:

COND HOTWELL HIGH LEVEL	CRP 906 A1-2 (5-6)
COND HOTWELL LOW LEVEL	CRP 906 A1-2 (6-6)
CONDENSATE PUMP A, B, OR C TRIP	CRP 906 A1-1 (1-4)

B -- SINCE CHANNEL B IS NOT SELECTED FOR HOTWELL LEVEL CONTROL, NO EFFECTS WILL BE OBSERVED. IF THE OPERATOR SELECTS CHANNEL B, THE EFFECTS WILL BE SIMILAR TO MALF A.

REF: P&ID 26013
CWD 356
OP 315

FW32 LOSS OF CONDENSATE PUMPS

A - COND PUMPS A AND C TRIP (LOW LEVEL SWITCH FAILS)

B - COND PUMP B TRIPS (LOW LEVEL SWITCH FAILS)

TYPE: GENERIC

CAUSE: A-LEVEL SWITCH LS-2-3 FAILS CLOSED

B-LEVEL SWITCH LS-2-4 FAILS CLOSED

PLANT STATUS: 100% POWER

EFFECTS: THE A AND C CONDENSATE PUMPS WILL TRIP. THE BOOSTER PUMPS AND FEED PUMPS MAY ALSO TRIP DUE TO LOW SUCTION PRESSURE RESULTING IN A COMPLETE LOSS OF FEEDWATER.

REACTOR WATER LEVEL WILL DECREASE AND THE REACTOR WILL SCRAM ON LOW WATER LEVEL. THE B CONDENSATE PUMP WILL CONTINUE TO RUN.

ATTEMPTING TO START THE A OR C CONDENSATE PUMP WILL CAUSE THE BREAKER TO CLOSE AND IMMEDIATELY TRIP.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF LS-2-3.

CONTROL ROOM INDCATIONS:

CONDENSATE PUMP STATUS LIGHTS

CONDENSATE PUMP AMPS

CONDENSATE AND FEEDWATER PRESSURES AND FLOWS

ANNUNCIATORS:

CONDENSATE PUMP A, B OR C TRIP	CRP 906 A1-1 (1-4)

B -- SIMILAR TO MALF A EXCEPT ONLY THE B PUMP TRIPS.

REF: P&ID 26013
CWD 356
OP 315

IA01 AIR COMPRESSOR TRIP

A - INSTRUMENT AIR COMPRESSOR A TRIP

B - INSTRUMENT AIR COMPRESSOR B TRIP

TYPE: GENERIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: ANY

EFFECTS: A -- IF RUNNING, OR WHEN STARTED, THE THERMAL OVERLOAD DEVICE WILL TRIP THE MOTOR SUPPLY BREAKER. THE COMPRESSOR WILL STOP AND THE COMPRESSOR TROUBLE ANNUNCIATOR WILL ACTUATE.

SYSTEM AIR PRESSURE WILL RESPOND TO DEMANDS DEPENDING ON WHICH AIR COMPRESSORS ARE RUNNING AND THE STATUS OF THE CROSSTIE VALVES.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESET THE BREAKER. THE ANNUNCIATOR WILL CLEAR AND THE COMPRESSOR WILL OPERATE NORMALLY.

CONTROL ROOM INDICATIONS:

COMPRESSOR STATUS LIGHTS

AIR SYSTEM PRESSURES

ANNUNCIATORS:

INSTRUMENT AIR COMPR "A" TROUBLE	CRP 906 A2-1 (3-1)

B -- SIMILAR TO MALF. A EXCEPT THAT INSTRUMENT AIR COMPRESSOR B WILL BE THE AFFECTED COMPONENT

REF: P&ID 26016
CWD 390
OP 333

IA02 SULLAIR AIR COMPRESSOR TRIP

- SULLAIR AIR COMPRESSOR TRIP

TYPE: SPECIFIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: ANY

EFFECTS: IF RUNNING, OR WHEN STARTED, THE THERMAL OVERLOAD DEVICE WILL TRIP THE MOTOR SUPPLY BREAKER AND THE COMPRESSOR WILL STOP. SYSTEM AIR PRESSURE WILL RESPOND TO DEMANDS DEPENDING ON WHICH COMPRESSORS ARE RUNNING AND THE STATUS OF THE CROSSTIE VALVES.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESET THE BREAKER AND THE COMPRESSOR WILL OPERATE NORMALLY.

CONTROL ROOM INDICATIONS:

COMPRESSOR STATUS LIGHTS

AIR SYSTEM PRESSURES

REF: P&ID 26016
CWD 389
OP 333

IA03 INSTRUMENT AIR HEADER LEAK

VARIABLE (100% = 2500 SCFM)

- INSTRUMENT AIR HEADER LEAK

TYPE: VARIABLE (100% = 2500 SCFM)

CAUSE: PIPING FAILURE DOWNSTREAM OF THE INSTRUMENT AIR DRYER.

PLANT STATUS: ANY

EFFECTS: THE INSTRUMENT AIR HEADER WILL IMMEDIATELY DEPRESSURIZE, AND THE INSTRUMENT AIR RECEIVER WILL RAPIDLY DEPRESSURIZE. IF CROSS-CONNECTED, THE SERVICE AIR SYSTEM WILL ALSO DEPRESSURIZE.

ALL COMPONENTS SUPPLIED BY INSTRUMENT AIR WILL GO TO THEIR FAIL POSITIONS AS THE HEADER PRESSURE DECREASES.

(REFER TO ONP 512, RAPID AND TOTAL LOSS OF INSTRUMENT AIR, FOR A LIST OF AIR OPERATED VALVES AND THEIR FAIL POSITION.)

THE PLANT WILL SCRAM AS INSTRUMENT AIR PRESSURE DROPS.

AT SMALL SEVERITIES, INSTRUMENT AIR HEADER PRESSURE WILL STABILIZE AT AN INTERMEDIATE PRESSURE. IF BELOW THE MINIMUM REQUIRED PRESSURE, COMPONENTS MAY FAIL TO INTERMEDIATE POSITIONS.

CONTROL ROOM INDICATIONS:

INSTRUMENT AIR PRESSURE

STATION AIR PRESSURE

ANNUNCIATORS:

INSTRUMENT AIR PRESSURE LOW	CRP 906 A2-1 (3-3)
INSTRUMENT AIR RECEIVER PRESSURE LOW	CRP 906 A-2 (4-2)
SCRAM PILOT AIR HEADER HI-LO PRESSURE	CRP 905 A2 (2-2)

REF: P&ID 26016
CWD 391A
OP 333

IA04 SERVICE AIR HEADER LEAK

VARIABLE (100% = 2500 SCFM)

- SERVICE AIR HEADER LEAK

TYPE: VARIABLE (100% = 2500 SCFM)

CAUSE: PIPING FAILURE

PLANT STATUS: ANY

EFFECTS: THE SERVICE AIR HEADER WILL IMMEDIATELY DEPRESSURIZE AND THE SERVICE AIR RECEIVER WILL RAPIDLY DEPRESSURIZE.

IF CROSS-CONNECTED, THE INSTRUMENT AIR HEADER WILL START TO DEPRESSURIZE BUT WILL ISOLATE AS PRESSURE DROPS, AND WILL THEN RECOVER.

AIR TO PURGE THE OFFGAS SYSTEM WILL BE LOST, BUT NO OTHER SIGNIFICANT EFFECTS WILL BE SEEN.

CONTROL ROOM INDICATIONS:

STATION AIR PRESSURE

INSTRUMENT AIR PRESSURE

OFFGAS FLOWS

ANNUNCIATORS:

STATION AIR PRESSURE LOW — CRP 906 A2-1 (4-1)

REF: P&ID 26016
CWD 391A
OP 333

IA05 NSS INSTRUMENT AIR LINE RUPTURE INSIDE PRIMARY CNTMT

VARIABLE (50% = D.W. COMPRESSOR CAPACITY)

- INSTRUMENT AIR LEAK IN CONTAINMENT

TYPE: SPECIFIC, VARIABLE

CAUSE: PIPE FAILURE DOWNSTREAM OF THE INBOARD INSTRUMENT AIR SUPPLY CHECK VALVE AT CONTAINMENT PENETRATION X-22.

PLANT STATUS: ANY

EFFECTS: THE INSTRUMENT AIR HEADER INSIDE THE CONTAINMENT WILL DEPRESSURIZE. THE DRYWELL COMPRESSOR RECEIVER PRESSURE WILL DECREASE. AS PRESSURE DROPS BELOW 95 PSIG, NITROGEN WILL ALSO BE SUPPLIED FROM THE NITROGEN GAS SUPPLY BOTTLES.

WITHOUT INSTRUMENT AIR, THE SRV'S WILL ONLY BE CAPABLE OF OPENING ABOUT FIVE TIMES MANUALLY. THE INBOARD MSIV'S WILL NOT BE CAPABLE OF OPENING OR WILL DRIFT SHUT AFTER ABOUT 30 MINUTES IF THEY ARE OPEN.

IF THE DRYWELL HEADER IS BEING SUPPLIED BY AIR THROUGH REMOTE FUNCTION IAR02, THE DRYWELL COMPRESSOR RECEIVER PRESSURE WILL NOT DECREASE AND THE DEMAND FOR AIR WILL BE SEEN IN THE INSTRUMENT AIR HEADER. IF ISOLATION VALVE 1-AC-50 IS SHUT, THE RUPTURE WILL BE ISOLATED.

CONTROL ROOM INDICATIONS:

DRYWELL COMPRESSOR STATUS

REF: P&ID 26009
OP 311D

IA06 DRYWELL COMPRESSOR TRIP

A - A DRYWELL COMPRESSOR TRIP

B - B DRYWELL COMPRESSOR TRIP

TYPE: GENERIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: ANY

EFFECTS: A -- IF RUNNING, OR WHEN STARTED, THE COMPRESSOR MOTOR SUPPLY BREAKER WILL TRIP. DRYWELL INSTRUMENT AIR PRESSURE WILL SLOWLY DECREASE UNTIL THE OTHER COMPRESSOR STARTS, OR THE BOTTLES BEGIN SUPPLYING PRESSURE.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17, WILL RESET THE BREAKER AND ALLOW NORMAL OPERATION OF THE COMPRESSOR.

CONTROL ROOM INDICATIONS:

DRYWELL COMPRESSOR PRESSURE

ANNUNCIATORS:

DRYWELL COMPRESSOR SYS TROUBLE	CRP 903 A4 (5-4)

B -- SIMILAR TO MALF. A.

REF: P&ID 26009
OP 311D

IA07 INSTRUMENT/SERVICE AIR CROSSCONNECT PCV'S FAIL CLOSED

A - AIR XCONN 1-IA-19 FAILS CLOSED

B - AIR XCONN 1-SA-21 FAILS CLOSED

TYPE: GENERIC

CAUSE: PRESSURE CONTROL VALVE SPRING FAILURE

PLANT STATUS: ANY

EFFECTS: A -- THE VALVE WILL CLOSE COMPLETELY PREVENTING INSTRUMENT AIR FROM SUPPLYING SERVICE AIR. IF 1-IA-19 WAS INTIALLY OPEN, THE SERVICE AIR PRESSURE WILL BEGIN DECREASING, DEPENDING ON USEAGE. WHEN STATION AIR PRESSURE DECREASES BELOW 85 PSIG, THE SA COMPRESSOR WILL START, IF IN STANDBY. BELOW 85 PSIG THE LOW PRESSURE ANNUNCIATOR WILL ACTUATE, AND THE INSTRUMENT AIR COMPRESSOR WILL START, IF IN STANDBY.

IF STATION AIR PRESSURE CONTINUES TO DECREASE, COMPONENTS SUPPLIED BY S.A. WILL BEGIN FAILING.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL VALVE OPERATION.

CONTROL ROOM INDICATIONS:

STATION AIR EMERG. SUPPLY VALVE STATUS LIGHT

STATION AIR PRESSURE

INSTRUMENT AIR PRESSURE

ANNUNCIATORS:

STATION AIR PRESSURE LOW	CRP 906 A2-1 (4-1)

B -- SIMILAR TO MALF. A, EXCEPT THAT IF INSTRUMENT AIR IS SUPPLYING STATION AIR, NO EFFECTS WILL BE SEEN.

REF: P&ID 26016
CWD 391
OP 333

IA08 SPARE

IA09 LOSS OF AIR CMPSR BREAKER CONTROL POWER

A - INSTR AIR COMP A LOSS OF CONTROL POWER

B - INSTR AIR COMP B LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES

PLANT STATUS: ANY

EFFECTS: A -- THE COMPRESSOR STATUS LIGHTS WILL GO OUT. THE COMPRESSOR WILL CONTINUE RUNNING BUT THE UNLOADING VALVE WILL OPEN PREVENTING IT FROM PRODUCING DISCHARGE PRESSURE. THE COOLING WATER VALVE WILL ALSO CLOSE, BUT SINCE THE COMPRESSOR IS UNLOADED, NO DAMAGE WILL OCCUR.

MALFUNCTION IA01 MAY BE USED IF IT IS DESIRED TO TRIP THE COMPRESSOR.

SUBSEQUENT EFFECTS WILL DEPEND ON THE S.A./I.A. CROSS-TIE STATUS.

REMOVAL OF THIS MALFUNCTION WILL RESTORE CONTROL POWER.

IF STILL RUNNING, THE COMPRESSOR UNLOADING VALVE WILL CLOSE AFTER ABOUT 10 SECONDS AND IT WILL BEGIN PRODUCING DISCHARGE PRESSURE.

CONTROL ROOM INDICATIONS:

COMPRESSOR STATUS LIGHTS

AIR PRESSURE

B -- SIMILAR TO MALF. A.

REF: P&ID 26016
CWD 393,390
OP 333

IA10 SPARE

LP01 LPCI PUMP TRIP

A - LPCI PUMP A TRIP

B - LPCI PUMP B TRIP

C - LPCI PUMP C TRIP

D - LPCI PUMP D TRIP

TYPE: GENERIC

CAUSE: OVERLOAD TRIP (RELAY 50)

PLANT STATUS: IN SUPPRESSION POOL COOLING

EFFECTS: A -- THE PUMP WILL STOP AND PUMP INDICATION WILL SHOW OFF (GREEN). PUMP FLOW WILL DECREASE TO 0 GPM. PUMP PRESSURE WILL DECREASE TO 0 PSI. THE LPCI PUMP A TRIPPED ANNUNCIATOR WILL ALARM.

CONTROL ROOM INDICATIONS:

LPCI PUMP A INDICATION

LPCI PUMP A FLOW

LPCI PUMP A PRESSURE

ANNUNCIATORS:

LPCI PUMP A OL OR TRIPPED	CRP 903 A1 (3-1)

THE PUMP WILL IMMEDIATELY TRIP IF STARTED WITH THE MALFUNCTION ACTIVE.

DEACTIVATING THE MALFUNCTION WILL RESTORE THE PUMP TO NORMAL OPERATION.

B-D SIMILAR TO MALF. A.

REF: CWD 761

LP02 LPCI PUMP FAILS TO AUTO START

A - LPCI PUMP A FAILS TO AUTO START

B - LPCI PUMP B FAILS TO AUTO START

C - LPCI PUMP C FAILS TO AUTO START

D - LPCI PUMP D FAIL TO AUTO START

TYPE: GENERIC

CAUSE: AUTO START CONTACT 1530-112 1-2 FAILS TO CLOSE.

PLANT STATUS: L.O.C.A.

EFFECTS: A -- WHEN THE LPCI AUTO START SIGNALS ARE SATISFIED THE PUMP WILL FAIL TO START. THE PUMP AUTO-RUN ANNUNCIATOR WILL ALARM. MANUAL OPERATION OF THE PUMP WILL BE POSSIBLE.

CONTROL ROOM INDICATIONS:

PUMP INDICATOR LIGHTS

PUMP FLOW

ANNUNCIATORS:

LPCI SYS I PUMP A OR C ON AUTO-RUN	CRP 903 A1 (5-4)
LPCI SYS I LOW FLOW	CRP 903 A1 (3-4)

DEACTIVATING THE MALFUNCTION WILL RESTORE THE AUTO START CONTACT TO NORMAL. PUMP WILL START IF AUTO START SIGNAL IS STILL PRESENT.

B-D -- SIMILAR TO MALF A

REF: CWD 761,780
OP 335

LP03 SPARE

LP04 LPCI HX BYPASS VALVE BINDS

VARIABLE (0-100% VALVE POSITION)

A - LPCI HX A BYPASS VLV BINDS

B - LPCI HX B BYPASS VLV BINDS

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: VALVE BINDING

PLANT STATUS: SECURING SUPPRESSION POOL COOLING

EFFECTS: A -- VALVE INDICATION WILL APPEAR NORMAL UNTIL THE SPECIFIED POSITION IS REACHED. THE LPCI VALVE MOTOR OVERLOAD ANNUNCIATOR WILL ACTUATE AND THE VALVE WILL STOP AT ITS PRESENT POSITION. 10 SECONDS AFTER RECEIPT OF THE ALARM, THE MOTOR BREAKER WILL TRIP DUE TO OVERCURRENT AND THE VALVE INDICATORS WILL EXTINGUISH.

DEACTIVATING THE MALFUNCTION AND RESET OF THE OVER-CURRENT DEVICE WITH REMOTE FUNCTION EDR17, WILL RESTORE THE VALVE MOTOR BREAKER.

CONTROL ROOM INDICATIONS:

1-LP-7A VALVE POSITION INDICATOR LIGHTS

ANNUNCIATORS:

LPCI SYS I OTHER VALVE MOTORS OVERLOAD	CRP 903 A-3 (2-7)

B - SIMILAR TO MALF A

REF: CWD 768
781A

LP05 LPCI TORUS SPRAY VALVE BINDS

VARIABLE (0-100% VALVE POSITION)

A - LPCI TORUS SPRAY VLV 1-LP-13A BINDS

B - LPCI TORUS SPRAY VLV 1-LP-13B BINDS

C - LPCI TORUS SPRAY VLV 1-LP-14A BINDS

D - LPCI TORUS SPRAY VLV 1-LP-14B BINDS

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: VALVE OPERATOR BINDING

PLANT STATUS: VALVE SURVEILLANCE TESTING

EFFECTS: A -- VALVE INDICATION WILL APPEAR NORMAL UNTIL THE SPECIFIED POSITION IS REACHED. THE LPCI VALVE MOTOR OVERLOAD ANNUNCIATOR WILL ACTUATE AND THE VALVE WILL STOP AT ITS PRESENT POSITION. 10 SECONDS AFTER RECEIPT OF THE ALARM THE MOTOR BREAKER WILL TRIP DUE TO OVERCURRENT AND THE VALVE INDICATORS WILL EXTINGUISH.

WHILE THIS MALFUNCTION IS ACTIVE, REMOTE FUNCTION LP?03 MAY BE USED TO POSITION THE VALVE.

CONTROL ROOM INDICATIONS:

1-LP-13A VALVE POSITION INDICATOR LIGHTS

ANNUNCIATORS:

LPCI SYS I OTHER VALVE MOTORS OVERLOAD	CRP 903 A-3 (2-7)

DEACTIVATING THE MALFUNCTION AND RESET OF THE OVER-CURRENT DEVICE WITH REMOTE FUNCTION EDR17, WILL RESTORE THE VALVE TO NORMAL OPERATION AND RECLOSE THE VALVE MOTOR BREAKER.

B-D SIMILAR TO MALF. A, EXCEPT MALF. B AND D ARE ON THROTTLE VALVES SO THE BREAKER WILL NOT TRIP UNLESS THE SWITCH IS HELD TO DRIVE THE VALVE, WHILE STUCK, FOR 10 SECONDS.

REF: CWD 776
731A

LP06 LPCI INJECTION VALVE BINDS

VARIABLE (0-100% VALVE POSITION)

A - LPCI INJECTION VLV 1-LP-10A BINDS

B - LPCI INJECTION VLV 1-LP-10B BINDS

C - LPCI INJECTION VLV 1-LP-9A BINDS

D - LPCI INJECTION VLV 1-LP-9B BINDS

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: VALVE OPERATOR BINDING

PLANT STATUS: VALVE SURVEILLANCE TESTING

EFFECTS: A -- VALVE INDICATION WILL APPEAR NORMAL UNTIL THE SPECIFIED POSITION IS REACHED. THE LPCI VALVE MOTOR OVERLOAD ANNUNCIATOR WILL ACTUATE AND THE VALVE WILL STOP AT ITS PRESENT POSITION. 10 SECONDS AFTER RECEIPT OF THE ALARM THE MOTOR BREAKER WILL TRIP DUE TO OVERCURRENT AND THE VALVE INDICATORS WILL EXTINGUISH UNLESS THE SWITCH IS RELEASED BEFORE THE BREAKER TRIPS, (MOTOR MUST BE ENERGIZED FOR 10 SECONDS WHILE STUCK TO TRIP.)

WHILE THIS MALFUNCTION IS ACTIVE, REMOTE FUNCTION LPR05 MAY BE USED TO POSITION THE VALVE.

DEACTIVATING THE MALFUNCTION AND RESET OF THE OVER-CURRENT DEVICE WITH REMOTE FUNCTION EDR17, WILL RESTORE THE VALVE MOTOR BREAKER TO NORMAL OPERATION AND UNBIND THE VALVE.

CONTROL ROOM INDICATIONS:

1-LP-10A VALVE POSITION INDICATOR LIGHTS

ANNUNCIATORS:

LPCI SYS I OTHER VALVE MOTORS OVERLOAD	CRP 903 A-3 (2-7)

B-D SIMILAR TO MALF A

REF: CWD 774
781A

LP07 LOSS OF LPCI PUMP BREAKER CONTROL POWER

A - LPCI PUMP A LOSS OF CONTROL POWER

B - LPCI PUMP B LOSS OF CONTROL POWER

C - LPCI PUMP C LOSS OF CONTROL POWER

D - LPCI PUMP D LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSE

PLANT STATUS: ANY

EFFECTS: A -- THE PUMP INDICATOR LIGHTS WILL EXTINGUISH. IF THE PUMP IS RUNNING IT WILL NOT BE POSSIBLE TO STOP THE PUMP AND IF THE PUMP IS STOPPED IT WILL NOT START EITHER AUTOMATICALLY OR MANUALLY. IF THE PUMP IS RUNNING AND MF LP01 IS ACTIVE CONCURRENTLY, THE BREAKER WILL NOT TRIP AND THE OVERCURRENT CONDITION WILL PROPAGATE TO THE 4160V BUS 14F.

DEACTIVATING THE MALFUNCTION WILL RESTORE THE CONTROL POWER SUPPLY.

CONTROL ROOM INDICATIONS:

LPCI PUMP 1A INDICATING LIGHTS

ANNNUNCIATORS:

NONE

B-D SIMILAR TO MALF. A

REF: CWD 761

MS01 MAIN STEAM HEADER RUPTURE INSIDE PRIMARY CONTAINMENT

VARIABLE (100%=15.0E6 LBM/HR)

- UNISOLABLE MAIN STEAM RUPTURE IN DW

TYPE: SPECIFIC, VARIABLE (100%=15.0E6 LBM/HR)

CAUSE: PIPE RUPTURE AT THE ELBOW DOWNSTEAM OF THE MAIN STEAM LINE C FLOW RESTRICTOR

PLANT STATUS: 100%

EFFECTS: SUDDEN FAILURE OF THE MAIN STEAM PIPE WILL ALLOW STEAM TO FLOW INTO THE DRYWELL, FROM BOTH THE UPSTREAM AND DOWNSTREAM SIDES OF THE BREAK IF THE SEVERITY IS LARGE. THE EFFECTS DEPEND GREATLY ON THE SEVERITY OF THE MALFUNCTION. THE FOLLOWING EFFECTS ARE BASED ON MAXIMUM SEVERITY.

STEAM FLOW THROUGH MAIN STEAM LINE C WILL INCREASE TO ABOUT 3.75 E6 LBM/HR, LIMITED BY THE FLOW RESTRICTOR. THE LOW PRESSURE WILL ALLOW FLOW TO REVERSE IN THE STEAM LINE. FLOW THROUGH STEAM LINES A, B, AND D WILL ALSO INCREASE. THE HIGH STEAM FLOW WILL ACTUATE THE GROUP I ISOLATION. ALL MSIV'S WILL BEGIN TO CLOSE. THE REACTOR WILL SCRAM.

DRYWELL PRESSURE WILL INCREASE RAPIDLY AND REACTOR WATER LEVEL WILL INCREASE RAPIDLY AS THE CORE VOIDS. AS THE VESSEL BLOWS DOWN THROUGH THE RUPTURE, LEVEL IN THE VESSEL WILL FALL.

ALL ECCS SYSTEMS WILL FUNCTION TO RESTORE REACTOR WATER LEVEL.

CONTROL ROOM INDICATION:

MAIN STEAM LINE FLOW

DRYWELL/TORUS PRESSURE/TEMPERATURE

REACTOR LEVEL/PRESSURE

ANNUNCIATORS:

MAIN STEAM LINE CH A HIGH FLOW	CRP 905 A1 (3-2)
MAIN STEAM LINE CH A LOW PRESSURE	CRP 905 A1 (4-2)

MS01

MAIN STEAM LINE CH B LOW PRESSURE	CRP 905 A1 (4-3)
REACTOR HI/LO LEVEL	CRP 905 A2 (2-1)
DRYWELL HI PRESSURE	CRP 903 A1 (2-3)
DRYWELL PRESS HIGH	CRP 904 A2 (4-1)

PRIMARY CONTAINMENT CRP 905
A2 HIGH PRESSURE (3-3)

RPV TURB TRIP A HI WATER LEVEL	CRP 905 A2 (8-1)
RPV TURB TRIP B HI WATER LEVEL	CRP 905 A2 (9-1)
HI RX WTR LEVEL FEED PUMP TRIP LOGIC ACTUATED	CRP 905 A3 (4-1)
MAIN STEAM ISOL VALVES NOT FULLY OPEN	CRP 905 A2 (4-4)
MSIV AC/DC SOLENOID TRIP	CRP 903 A3-2 (9-7)

REF: P&ID 29119 (SH 248)
CWD 611
OP 506
FSAR CH 5 & 6

MS02 STEAM RUPTURE INSIDE D.W., DOWNSTREAM OF MSIV'S

VARIABLE (100%=15.0E6 LBM/HR)

A - STEAM LINE A RUPTURE IN DW

B - STEAM LINE B RUPTURE IN DW

C - STEAM LINE C RUPTURE IN DW

D - STEAM LINE D RUPTURE IN DW

TYPE: GENERIC, VARIABLE (100%=15.0E6 LBM/HR)

CAUSE: PIPE RUPTURE IMMEDIATELY DOWNSTREAM OF THE INBOARD MSIV

PLANT STATUS: 100%

EFFECTS: A -- SUDDEN FAILURE OF THE MAIN STEAM PIPE WILL ALLOW STEAM TO FLOW INTO THE DRYWELL, FROM BOTH THE UPSTREAM AND DOWNSTREAM SIDES OF THE BREAK IF THE SEVERITY IS LARGE. THE EFFECTS DEPEND GREATLY ON THE SEVERITY OF THE MALFUNCTION. THE FOLLOWING EFFECTS ARE BASED ON MAXIMUM SEVERITY.

STEAM FLOW THROUGH MAIN STEAM LINE C WILL INCREASE TO ABOUT 3.75 E6 LBM/HR, LIMITED BY THE FLOW RESTRICTOR. THE LOW PRESSURE WILL ALLOW FLOW TO REVERSE IN THE STEAM LINE. FLOW THROUGH STEAM LINES A, B, AND D WILL ALSO INCREASE. THE HIGH STEAM FLOW WILL ACTUATE THE GROUP I ISOLATION. ALL MSIV'S WILL BEGIN TO CLOSE. THE REACTOR WILL SCRAM.

DRYWELL PRESSURE WILL INCREASE RAPIDLY AND REACTOR WATER LEVEL WILL INCREASE AS THE CORE VOIDS.

FLOW THROUGH THE RUPTURE WILL STOP AS THE MSIVS CLOSE IN 3-5 SECONDS. REACTOR WATER LEVEL WILL DECREASE RAPIDLY AS VOIDS COLLAPSE AND
PRESSURE
REACTOR
INCREASES. ECCS WILL INITIATE AND RESTORE WATER LEVEL.

CONTROL ROOM INDICATION AND ANNUNCIATORS WILL BE SIMILAR TO THOSE LISTED IN MS01.

B-D SIMILAR TO MALF A.

REF: P&ID 29119 (SH 248)
CWD 611
OP 516B

MS03 STEAM RUPTURE IN TUNNEL, DOWNSTREAM OF MSIV'S

VARIABLE (100%=15.0E6 LBM/HR)

A - STEAM LINE A RUPTURE IN STEAM TUNNEL

B - STEAM LINE B RUPTURE IN STEAM TUNNEL

C - STEAM LINE C RUPTURE IN STEAM TUNNEL

D - STEAM LINE D RUPTURE IN STEAM TUNNEL

TYPE: GENERIC, VARIABLE (100%=15.0E6 LBM/HR)

CAUSE: PIPE RUPTURE IMMEDIATELY DOWNSTREAM OF THE OUTBOARD MSIV

PLANT STATUS: 100%

EFFECTS: A -- SUDDEN FAILURE OF THE MAIN STEAM PIPE WILL ALLOW STEAM TO FLOW INTO THE TUNNEL. STEAM FLOW THROUGH THE A MAIN STEAM FLOW RESTRICTORS WILL BE LIMITED TO ABOUT 3.75 E6 LBM/HR. REVERSE FLOW WILL ALLOW STEAM FROM THE OTHER LINES TO ENTER THE TUNNEL FROM DOWNSTREAM OF THE BREAK.

THE REACTOR PRESSURE-LEVEL TRANSIENT WILL BE SIMILAR TO THAT DESCRIBED IN MS02. THE MSIVS WILL CLOSE TO ISOLATE THE RUPTURE IN 3-5 SECONDS. STEAM IN THE TUNNEL WILL BE CONDENSED BY THE SPACE COOLERS, AND THE TUNNEL TEMPERATURE WILL EVENTUALLY DROP BELOW THE HIGH TEMPERATURE TRIP SETPOINT. AIRBORNE ACTIVITY FROM THE STEAM WILL PROPAGATE THROUGH THE VENTILATION SYSTEM AND WILL ACTIVATE STEAM TUNNEL VENTILATION RADIATION MONITORING EQUIPMENT.

CONTROL ROOM INDICATIONS:

MAIN STEAM LINE FLOWS

REACTOR LEVEL/PRESSURE

STEAM TUNNEL TEMPERATURE

ANNUNCIATORS:

MAIN STEAM LINE CH A HIGH FLOW	CRP 905 A1 (3-2)
MAIN STEAM LINE CH A LOW PRESSURE	CRP 905 A1 (4-2)
MAIN STEAM LINE CH B LOW PRESSURE	CRP 905 A1 (4-3)

MS03

MSIV AC/DC SOLENOID TRIP	CRP 903 A3-2 (9-7)
REACTOR HI/LO LEVEL	CRP 905 A2 (2-1)
RPV TURB TRIP A HI WATER LEVEL	CRP 905 A2 (8-1)
RPV TURB TRIP B HI WATER LEVEL	CRP 905 A2 (9-1)
HI RX WTR LEVEL FEED PUMP TRIP LOGIC ACTUATED	CRP 905 A3 (9-1)
MAIN STEAM ISOL VALVES NOT FULLY OPEN	CRP 905 A2 (4-4)

B-D SIMILAR TO MALF A.

REF:
P&ID 29119 (SH 2 & 8)
CWD 611
OP 516B
FSAR CH 5 & 6

MS04 MAIN STEAM LINE RUPTURE IN HEATER BAY

VARIABLE (100%=25.9E6 LBM/HR)

- STEAM RUPTURE IN HEATER BAY

TYPE: SPECIFIC, VARIABLE (100%=25.9E6 LBM/HR)

CAUSE: PIPE RUPTURE IN THE LINE FROM THE "B" MAIN STEAM LINE TO THE BYPASS CONTROL VALVE CHEST

PLANT STATUS: 100%

EFFECTS: THE RUPTURE WILL ALLOW STEAM TO FLOW INTO THE TURBINE BUILDING FROM THE "B" MAIN STEAM LINE DIRECTLY AND FROM THE "A" MAIN STEAM LINE THROUGH THE BYPASS CONTROL VALVE CHEST M1-5A. THE HIGH FLOW IN MAIN STEAM LINE B WILL INITIATE A GROUP I ISOLATION CAUSING THE MSIV'S TO CLOSE IN 3-5 SECONDS. THE REACTOR WILL SCRAM AS THE RESULT OF MSIV CLOSURE.

THE REACTOR PRESSURE/LEVEL TRANSIENT WILL BE SIMILAR TO THAT DESCRIBED IN MS02. THE STEAM RELEASED IN THE TURBINE BUILDING WILL BE SEEN IN THE TURBINE BUILDING EQUIPMENT DRAIN SUMP, INCREASED RADIATION LEVELS IN THE VENTILATION SYSTEM, AND INCREASED HEAT LOAD ON TBSCCW.

CONTROL ROOM INDICATIONS:

MAIN STEAM LINE FLOWS

REACTOR LEVEL/PRESSURE

VENTILATION RADIATION LEVELS

ANNUNCIATORS:

MAIN STEAM LINE CH A HIGH FLOW	CRP 905 A1 (3-2)
MAIN STEAM LINE CH A LOW PRESSURE	CRP 905 A1 (4-2)
MAIN STEAM LINE CH B LOW PRESSURE	CRP 905 A1 (4-3)
MSIV AC/DC SOLENOID TRIP	CRP 903 A3-2 (9-7)
REACTOR HI/LOW LEVEL	CRP 905 A2 (2-1)

MS04

RPV TURB TRIP A HI WATER LEVEL	CRP 905 A2 (8-1)
RPV TURB TRIP B HI WATER LEVEL	CRP 905 A2 (9-1)
HI RX WTR LEVEL FEED PUMP TRIP LOGIC ACTUATED	CRP 905 A3 (4-1)
MAIN STEAM ISOL VALVES NOT FULLY OPEN	CRP 905 A2 (4-4)

REF:

P&ID 26012
CWD 611
OP 516B
FSAR CH 5 & 6

MS05 MSIV CLOSURE

VARIABLE (100% = VALVE FULLY CLOSED)

A - MSIV 1A CLOSURE

B - MSIV 1B CLOSURE

C - MSIV 1C CLOSURE

D - MSIV 1D CLOSURE

E - MSIV 2A CLOSURE

F - MSIV 2B CLOSURE

G - MSIV 2C CLOSURE

H - MSIV 2D CLOSURE

TYPE: GENERIC, VARIABLE (100% = VALVE FULLY CLOSED)

CAUSE: AIR LEAKAGE FROM THE OPENING AIR LINE, BETWEEN THE TEST SOLEN[illegible]D VALVE AND THE MSIV OPERATING CYLINDER

PLANT STATUS: 100%

EFFECTS: A -- LEAKAGE WILL CAUSE THE OPENING AIR PRESSURE TO DECREASE ALLOWING THE MSIV TO CLOSE. THE VALVE WILL GO THE INSTRUCTOR SPECIFIED POSITION, BUT NO FASTER THAN THE FAST CLOSURE STROKE TIME OF 3-5 SECONDS.

AS THE VALVE LEAVES THE FULL OPEN POSITION, FLOW WILL BE SHIFTED TO THE OTHER THREE MAIN STEAM LINES. IF FLOW INCREASES ABOVE 120% IN ANY OF THE STEAM LINES, A GROUP I ISOLATION WILL OCCUR.

IF MORE THAN ONE MSIV IS LESS THAN 90% OPEN, THE MSIV NOT FULLY OPEN ANNUNCIATOR MAY ACTUATE AND A REACTOR PROTECTION CHANNEL MAY TRIP.

REMOVAL OF THE MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE MSIV.

CONTROL ROOM INDICATIONS:

MAIN STEAM LINE FLOWS

MSIV POSITION LIGHTS

ANNUNCIATORS:

MS05

MAIN STEAM LINE CH A HIGH FLOW	CRP 905 A1 (3-2)
MAIN STEAM LINE CH B HIGH FLOW	CRP 905 A1 (4-2)
MAIN STEAM ISOL VALVES NOT FULLY OPEN	CRP 905 A2 (4-4)

B-H SIMILAR TO MALF A.

REF: P&ID 29119, SH 248
CWD 585
OP 317

MS06 GLAND SEAL REGULATOR FAILURE

A - SEAL STEAM SUPPLY VALVE FAILS CLOSED

B - SEAL STEAM UNLOADER VALVE FAILS CLOSED

TYPE: GENERIC

CAUSE: MECHANICAL FAILURE OF THE GLAND SEAL REGULATOR

PLANT STATUS: A - STARTUP; B - 100% POWER

EFFECTS: A -- WITH NO TURBINE STEAM FLOW, THE SEAL STEAM HEADER IS SUPPLIED FROM THE MAIN STEAM LINES THROUGH THE SEAL STEAM REGULATOR. THIS MALFUNCTION WILL CAUSE THE SUPPLY VALVE TO CLOSE STOPPING THE FLOW FROM MAIN STEAM. THE SEAL STEAM HEADER WILL RAPIDLY DEPRESSURIZE. AT 2.5 PSIG THE LOW PRESSURE ANNUNCIATOR WILL ACTUATE. AIR WILL BE DRAWN INTO THE MAIN CONDENSER WHEN PRESSURE DECREASES TO ZERO PSIG. WITH NORMAL VACUUM, AIR INLEAKAGE WILL BE ABOUT 1800 SCFM. MAIN CONDENSER VACUUM WILL DECREASE UNTIL THE AIR REMOVAL FLOW BALANCES WITH THE AIR INLEAKAGE.

B -- AT FULL POWER, THE SEAL STEAM HEADER IS SUPPLIED FROM THE HIGH PRESSURE TURBINE GLAND LEAKOFF, WHICH [illegible] THAN SUFFICIENT. EXCESS STEAM IS PASSED TO [illegible] LOW PRESSURE FEED HEATER THROUGH GLAND SEAL REGULATOR UNLOADING VALVE. THIS MALFUNCTION WILL CAUSE T[illegible] UNLOADING VALVE TO CLOSE. SEAL STEAM HEADE[illegible]SSURE WILL INCREASE. AT 20 PSIG, RELIEF [illegible]LV[illegible] OPEN DUMPING STEAM TO THE MAIN CONDENSER [illegible]NG PRESSURE TO LESS THAN 25 PSIG.

[illegible] THE MALFUNCTION WILL RESTORE NORMAL [illegible]ON OF THE GLAND SEAL REGULATOR.

CONTROL ROOM INDICATIONS:

SEAL STEAM HEADER PRESSURE

MAIN CONDENSER VACUUM

ANNUNCIATORS:

SEAL STEAM REGULATOR PRESSURE LOW	CRP 907 A1-1 (6-3)

REF: P&ID 26012, GE 717E296
CWD 410
OP 314

MS07 SJAE PRESSURE CONTROL VALVE FAILURE

VARIABLE (0-100% VALVE POSITION)

A - SJAE A STEAM SUPPLY VALVE FAILS

B - SJAE B STEAM SUPPLY VALVE FAILS

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: MECHANICAL FAILURE

PLANT STATUS: 100% POWER

EFFECTS: A -- THE SJAE STEAM SUPPLY PRESSURE CONTROL VALVE WILL GO TO THE INSTRUCTOR SPECIFIED POSITION.

IF THE MALFUNCTION CAUSES THE VALVE TO OPEN FROM IT NORMAL POSITION, STEAM SUPPLY PRESSURE TO THE SJAE WILL INCREASE TO ABOUT 140 PSIG AND THE RELIEF VALVE WILL OPEN TO DUMP EXCESS STEAM TO THE MAIN CONDENSER. STEAM FLOW TO THE OFFGAS SYSTEM WILL INCREASE. NON-CONDENSIBLE FLOW TO OFFGAS WILL NOT CHANGE SINCE THE SJAE PERFORMANCE IS RELATIVELY CONSTANT IN THIS PRESSURE RANGE.

IF THE MALFUNCTION CAUSES THE VALVE TO CLOSE FROM ITS NORMAL POSITION, STEAM SUPPLY PRESSURE TO THE SJAE WILL DECREASE. AS PRESSURE DROPS BELOW 100 PSIG, THE LOW PRESSURE ANNUNCIATOR WILL ACTUATE AND THE 1ST STAGE SJAE WILL BEGIN TO STALL. WHEN PRESSURE DROPS TO 70 PSIG, THE AIR SUCTION VALVES WILL CLOSE. FLOW TO THE OFF-GAS SYSTEM WILL DECREASE. BELOW 70 PSIG, FLOW TO THE OFFGAS SYSTEM WILL STOP, AS THE AIR EJECTORS NO LONGER FUNCTION CORRECTLY. CONDENSER VACUUM WILL BEGIN DECREASING.

REMOVAL OF THE MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE VALVE.

B -- SIMILAR TO MALF A.

CONTROL ROOM INDICATIONS:

SJAE STEAM PRESSURE

SJAE EXHAUST FLOW RECORDER

RECOMBINER FLOW

MAIN CONDENSER VACUUM

MS07

ANNUNCIATORS:

STEAM TO AIR EJECTORS PRESSURE LOW	CRP 907 A2-2 (1-6)

REF: P&ID 26012
CWD 412
OP 324A

MS08 SPURIOUS GROUP ONE ISOLATION

- SPURIOUS GROUP I ISOLATION

TYPE: SPECIFIC

CAUSE: SIMULTANEOUS FAILURE OF ALL 595-106 RELAYS

PLANT STATUS: 100%

EFFECTS: GROUP ONE ISOLATION WILL OCCUR WITH NO INDICATION OF CAUSE. ALL MSIVS, THE MAIN STEAM DRAIN ISOLATION VALVE (1-MS-5 AND 1-MS-6) THE ISO CONDENSER VENT VALVES AND THE RR LOOP SAMPLE VALVES WILL CLOSE. THE REACTOR WILL SCRAM DUE TO MSIV POSITION. THE GROUP I ISOLATION CAN NOT BE RESET.

REMOVAL OF THE MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE RELAYS AND ALLOW THE ISOLATION TO BE RESET.

CONTROL ROOM INDICATIONS:

MSIV POSITION LIGHTS

MAIN STEAM LINE FLOWS

REACTOR PRESSURE

ISO CONDENSER VENT POS LIGHTS

RECIRC LOOP SAMPLE POS LIGHTS

ANNUNCIATORS:

MAIN STEAM ISOL VALVES NOT FULLY OPEN	CRP 905 A2 (4-4)
MSIV AC/DC SOLENOID TRIP	CRP 903 A3-2 (9-7)

REF: P&ID 29119 SH 248
CWD 610, 478, 888
OP 207
GE NEDO-13201

MS09 TURBINE EXHAUST HOOD SPRAY VLV 1-CN-47 FAILS CLOSED

- EXHAUST HOOD SPRAY VALVE FAILS CLOSED

TYPE: SPECIFIC

CAUSE: TEMPERATURE CONTROLLER FAILURE

PLANT STATUS: TURBINE IDLING AT RATED SPEED, UNLOADED

EFFECTS: THE FAILURE WILL CAUSE LOSS OF OPERATING AIR PRESSURE TO THE HOOD SPRAY VALVE CAUSING IT TO FAIL CLOSED. IF IT WAS ALREADY OPEN, THE LOSS OF HOOD SPRAY FLOW (LESS THAN 6 PSIG DOWNSTREAM OF THE VALVE) WILL BE SEEN BY DEACTUATION OF THE HOOD SPRAY OPERATING ANNUNCIATOR AND DEENERGIZATION OF THE RED LIGHT ABOVE THE TURBINE EXHAUST HOOD SPRAY VALVE CONTROL SWITCH. WITHOUT HOOD SPRAY FLOW, THE TURBINE EXHAUST HOOD TEMPERATURES WILL INCREASE. AT 175 DEG F THE HIGH TEMPERATURE ANNUNCIATOR WILL ACTUATE. AT 225 DEG F THE TURBINE WILL TRIP.

MANUAL OPERATION OF THE BYPASS VALVE WILL ALLOW HOOD SPRAY FLOW TO START. THE RED LIGHT AND ANNUNCIATOR WILL ACTUATE INDICATING THE PRESENCE OF HOOD SPRAY FLOW, AND TURBINE EXHAUST HOOD TEMPERATURES WILL BEGIN TO DECREASE.

REMOVAL OF THE MALFUNCTION WILL RESTORE THE HOOD SPRAY VALVE OPERATION TO NORMAL.

CONTROL PANEL INDICATION:

TURBINE TEMPERATURE AND EXPANSION RECORDER
- PT-6 EXHAUST HOOD "A" G END-RIGHT
- PT-9 EXHAUST HOOD "B" G END-LEFT
- PT-10 EXHAUST HOOD "A" TB END-RIGHT
- PT-13 EXHAUST HOOD "B" TB END-LEFT
- PT-14 EXHAUST HOOD "A" TB END-LEFT
- PT-17 EXHAUST HOOD "B" TB END-RIGHT

ANNUNCIATORS:

TURBINE EXHAUST HOOD WATER SPRAY OPERATING	CRP 907 A1-1 (3-2)
TURBINE EXHAUST HOOD TEMPERATURE HIGH 175 DEG	CRP 907 A1-1 (2-2)
TURBINE EXHAUST HOOD HIGH TEMPERATURE TRIP	CRP 907 A1-1 (1-2)

MS09

REF:	P&ID	26013
	CWD	85
	OP	314

MS10 MOIST SEPARATOR DRN TANK NORM LVL CONTROLLER FAILURE

VARIABLE (0-100% VALVE POSITION)

A - MS DRN TK A NORM LVL CONT VALVE FAILURE

B - MS DRN TK B NORM LVL CONT VALVE FAILURE

C - MS DRN TK C NORM LVL CONT VALVE FAILURE

D - MS DRN TK D NORM LVL CONT VALVE FAILURE

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: FAILURE OF CONTROLLER OUTPUT I/P CONVERTER

PLANT STATUS: 100%

EFFECTS: A -- THE NORMAL LEVEL CONTROL VALVE WILL GO TO THE INSTRUCTOR SPECIFIED POSITION DUE TO FAILURE OF THE PNEUMATIC POSITION CONTROLLER.

IF THE VALVE OPENS TO MORE THAN THAT REQUIRED FOR NORMAL FLOW, THE MOISTURE SEPARATOR DRAIN TANK LEVEL WILL BEGIN DECREASING. THE LOW LEVEL ANNUNCIATOR WILL ACTUATE. THE DRAIN TEMPERATURE WILL INCREASE TO SATURATION WHEN IT DRAINS COMPLETELY.

WHEN STEAM BEGINS BLOWING THROUGH, THE MOISTURE SEPARATOR HIGH LEVEL SWITCH WILL ACTUATE DUE FLASHING AND HIGH FLOW RATES AND THE TURBINE MAY TRIP.

IF THE VALVE CLOSES TO LESS THAN REQUIRED FOR NORMAL FLOW, THE DRAIN TANK LEVEL WILL BEGIN INCREASING. THE EMERGENCY LEVEL CONTROL VALVE WILL BEGIN TO OPEN AND WILL CONTROL LEVEL AT ITS SETPOINT. REDUCED HEATING WILL BE SEEN IN THE H.I.P. HEATERS DUE TO DIVERSION OF THIS SOURCE OF HEATING TO THE MAIN CONDENSER.

ANNUNCIATORS:

MOIST SEP DRAIN TANK A HI/LO LEVEL	CRP 907 A1-1 (5-4)

B-D SIMILAR TO MALF A.

REF: P&ID 26104
CWD 387
OP 348

MS11 MOIST SEPARATOR DRN TANK EMERG LVL CONTROLLER FAILURE

VARIABLE (0-100% VALVE POSITION)

A - MS DRN TK A EMERG LVL CONT VALVE FAILURE

B - MS DRN TK B EMERG LVL CONT VALVE FAILURE

C - MS DRN TK C EMERG LVL CONT VALVE FAILURE

D - MS DRN TK D EMERG LVL CONT VALVE FAILURE

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: FAILURE OF CONTROLLER OUTPUT

PLANT STATUS: 100%

EFFECTS: A -- THE EMERGENCY LEVEL CONTROL VALVE WILL GO TO THE INSTRUCTOR SPECIFIED POSITION DUE TO FAILURE OF THE PNEUMATIC POSITION CONTROLLER.

AS THE VALVE OPENS, THE NORMAL LEVEL CONTROL VALVE WILL CLOSE DUE TO DECREASING LEVEL IN THE DRAIN TANK. THE LOW LEVEL ANNUNCIATOR MAY EVENTUALLY ACTUATE IF THE EMERGENCY VALVE OPENS MORE THAN REQUIRED FOR LEVEL CONTROL. IF THE TANK DRAINS COMPLETELY, THE DRAIN TEMPERATURE WILL INCREASE TO SATURATION TEMPERATURE AS STEAM BEGINS BLOWING BY TO THE MAIN CONDENSER.

WHEN STEAM BEGINS BLOWING THROUGH, THE MOISTURE SEPARATOR HIGH LEVEL SWITCH WILL ACTUATE DUE TO FLASHING AND HIGH FLOW RATES AND THE TURBINE MAY TRIP.

ANNUNCIATORS:

HEATER LEVEL HI/LO CRP 923 ANNUNCIATOR	CRP 906 A1-2 (4-6)
HP HEATER "A" LEVEL LOW	CRP 923 (1-2)

B-D SIMILAR TO MALF A.

REF: P&ID 26104
CWD 387
OP 348

NI01 APRM FAILURE

VARIABLE (0-100% AMPLIFIER OUTPUT)

A - APRM 1 FAILURE

B - APRM 2 FAILURE

C - APRM 3 FAILURE

D - APRM 4 FAILURE

E - APRM 5 FAILURE

F - APRM 6 FAILURE

MF SEVERITY	APRM	TRIP FUNCTION
96.0%	120%	HI-HI
	(OR 0.58 W + 62)	
86.4%	108%	HI
	(OR 0.58 W + 50)	
72.0%	90%	SETDOWN HI-HI
12.0%	15%	HI-HI(NOT IN RUN)
10.0%	12%	HI (NOT IN RUN)
2.4%	3%	DOWNSCALE

TYPE: GENERIC, VARIABLE (0-100% AMPLIFIER OUTPUT)

CAUSE: ELECTRONIC FAILURE IN THE AVERAGING AMPLIFIER

PLANT STATUS: 100% POWER

EFFECTS: A -- THE OUTPUT OF THE AVERAGING AMPLIFIER WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. IF THE OUTPUT EXCEEDS THE LISTED VALUES, THE ASSOCIATED APRM WILL TRIP AND APPROPRIATE PROTECTIVE ACTIONS AND ANNUNCIATORS WILL ACTUATE.

AFTER THE OUTPUT HAS RETURNED TO NORMAL, THE TRIP FUNCTION WILL RESET AUTOMATICALLY.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE AVERAGING AMPLIFIER OUTPUT TO NORMAL.

NI01

CONTROL ROOM INDICATIONS:

APRM RECORDERS

APRM VOLT METERS

RPS SCRAM CHANNEL TRIPS

APRM STATUS LIGHTS

ANNUNCIATORS:

APRM CH 1,2,3 HI HI FLUX/INOP	CRP 905 A1 (1-4)
APR CH 4,5,6 HI HI FLUX/INOP	CRP 905 A1 (2-4)
APRM HI FLUX	CRP 905 A1 (3-4)
APRM DOWNSCALE	CRP 905 A1 (4-4)
RBM HI FLUX/INOP	CRP 905 A1 (6-4)
RBM DOWNSCALE	CRP 905 A1 (7-4)
REACTOR NEUTRON MON SYS TRIP	CRP 905 A2 (7-3)

B-F SIMILAR TO MALF A.

REF: CWD 649
GEK 26920A

NI02 IRM FAILURE

VARIABLE (0-100% AMPLIFIER OUTPUT)

A - IRM 11 FAILURE

B - IRM 12 FAILURE

C - IRM 13 FAILURE

D - IRM 14 FAILURE

E - IRM 15 FAILURE

F - IRM 16 FAILURE

G - IRM 17 FAILURE

H - IRM 18 FAILURE

MF SEVERITY	IRM	TRIP FUNCTION
96.0%	120/125	HI-HI
86.4%	108/125	HI
2.4%	3/125	DOWNSCALE

TYPE: GENERIC, VARIABLE (0-100% AMPLIFIER OUTPUT)

CAUSE: ELECTRONIC FAILURE IN THE OUTPUT AMPLIFIER

PLANT STATUS: STARTUP

EFFECTS: A -- THE AMPLIFIER OUTPUT SIGNAL WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. THE RANGE SWITCH WILL NOT AFFECT THE OUTPUT SIGNAL. IF THE OUTPUT EXCEEDS THE LISTED VALUES, THE ASSOCIATED IRM FUNCTION WILL TRIP AND APPROPRIATE PROTECTIVE ACTIONS AND ANNUNCIATORS WILL ACTUATE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE AMPLIFIER OUTPUT TO NORMAL.

CONTROL ROOM INDICATIONS:

IRM RECORDERS

IRM STATUS LIGHTS

RPS SCRAM CHANNEL TRIPS

NI02

ANNUNCIATORS:

IRM CH A HI-HI FLUX/INOP	CRP 905 A1 (7-1)
IRM HI FLUX	CRP 905 A1 (8-1)
IRM DOWNSCALE	CRP 905 A1 (9-1)
REACTOR NEUTRON MON SYS TRIP	CRP 905 A2 (7-3)

B-H SIMILAR TO MALF A.

REF: CWD 637
GEK 27723B

NI03 SRM FAILURE

VARIABLE (0-100% AMPLIFIER OUTPUT)

A - SRM 21 FAILURE

B - SRM 22 FAILURE

C - SRM 23 FAILURE

D - SRM 24 FAILURE

MF SEVERITY	SRM	TRIP FUNCTION
95.5%	5E5 CPS	HI-HI
85.4%	1E5 CPS	HI
42.9%	1E2 CPS	RETRACT PERMIT
21.1%	3E0 CPS	DOWNSCALE

TYPE: GENERIC, VARIABLE (0-100% AMPLIFIER OUTPUT)

CAUSE: ELECTRONIC FAILURE IN THE LOG COUNT RATE AMPLIFIER

PLANT STATUS: STARTUP

EFFECTS: A -- THE AMPLIFIER OUTPUT WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. THE LOG COUNT RATE INDICATIONS WILL RESPOND LINEARLY TO MALFUNCTION SEVERITY AT THE RATE OF ABOUT 14.3% SEVERITY PER DECADE. THE PERIOD INDICATION WILL ALSO RESPOND TO CHANGES IN SEVERITY. IF THE OUTPUT EXCEEDS THE LISTED APPROXIMATE VALUES, THE ASSOCIATED SRM FUNCTION WILL TRIP AND APPROPRIATE PROTECTIVE ACTIONS AND ANNUNCIATORS WILL ACTUATE.

IF INCREASING MALFUNCTION SEVERITY, WHEN THE PERIOD INDICATION EXCEEDS 10 SECONDS THE HIGH PERIOD ALARM WILL COME IN.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE AMPLIFIER OUTPUT TO NORMAL.

CONTROL ROOM INDICATIONS:

SRM CONT RATE AND PERIOD

SRM STATUS LIGHTS

NI03

ANNUNCIATORS:

SRM HI HI FLUX	CRP 905 A1 (2-1)
SRM HI FLUX/INOP	CRP 905 A1 (3-1)
SRM PERIOD	CRP 905 A1 (4-1)
SRM DOWNSCALE	CRP 905 A1 (5-1)

B-D SIMILAR TO MALF A.

REF: CWD 637
GEK 13914
IC 401

NI04 LPRM FAILURE

VARIABLE (0-100% AMPLIFIER OUTUT)

APRM CH. 1	APRM CH. 2	APRM CH. 3	LPRM GP. 1
A01 = 2A-04-37	B01 = 1A-12-45	C01 = 2A-20-37	G01 = 1A-28-45
A02 = 3A-36-37	B02 = 3A-28-29	C02 = 4A-04-21	G02 = 2A-12-29
A03 = 4A-20-21	B03 = 4A-12-13	C03 = 5A-36-21	G03 = 3A-44-29
A04 = 6A-36-05	B04 = 5A-44-13	C04 = 6A-20-05	G04 = 4A-28-13
A05 = 1B-28-45	B05 = 2B-04-37	C05 = 1B-12-45	G05 = 2B-20-37
A06 = 2B-12-29	B06 = 3B-36-37	C06 = 3B-28-29	G06 = 4B-04-21
A07 = 3B-44-29	B07 = 4B-20-21	C07 = 4B-12-13	G07 = 5B-36-21
A08 = 4B-28-13	B08 = 6B-36-05	C08 = 5B-44-13	G08 = 6B-20-05
A09 = 2C-20-37	B09 = 1C-28-45	C09 = 2C-04-37	G09 = 1C-12-45
A10 = 4C-02-21	B10 = 2C-12-29	C10 = 3C-36-37	G10 = 3C-28-29
A11 = 5C-36-21	B11 = 3C-44-29	C11 = 4C-20-21	G11 = 4C-12-13
A12 = 6C-20-05	B12 = 4C-28-13	C12 = 6C-36-05	G12 = 5C-44-13
A13 = 1D-12-43	B13 = 2D-20-37	C13 = 1D-28-45	G13 = 2D-04-37
A14 = 3D-28-29	B14 = 4D-04-21	C14 = 2D-12-29	G14 = 3D-36-37
A15 = 4D-12-13	B15 = 5D-36-21	C15 = 3D-44-29	G15 = 4D-20-21
A16 = 5D-44-13	B16 = 6D-20-05	C16 = 4D-28-13	G16 = 3D-36-05

APRM CH. 4	APRM CH. 5	APRM CH. 6	LPRM GP. 1
D01 = 1A-20-45	E01 = 3A-28-37	F01 = 2A-36-45	H01 = 2A-12-37
D02 = 3A-04-29	E02 = 4A-12-21	F02 = 3A-20-29	H02 = 3A-44-37
D03 = 4A-36-29	E03 = 5A-44-21	F03 = 6A-36-13	H03 = 4A-28-21
D04 = 5A-20-13	E04 = 6A-28-05	F04 = 3B-28-37	H04 = 2B-36-45
D05 = 2B-12-37	E05 = 1B-20-45	F05 = 4B-12-21	H05 = 3B-20-29
D06 = 3B-44-37	E06 = 3B-04-29	F06 = 5B-44-21	H06 = 6B-36-13

NI04

D07 = 4B-28-21	E07 = 4B-36-29	F07 = 6B-28-05	H07 = 3C-28-37
D08 = 2C-36-45	E08 = 5B-20-13	F08 = 1C-20-45	H08 = 4C-12-21
D09 = 3C-20-29	E09 = 2C-12-37	F09 = 3C-04-29	H09 = 5C-44-21
D10 = 6C-36-13	E10 = 3C-44-37	F10 = 4C-36-29	H10 = 6C-28-05
D11 = 3D-28-37	E11 = 4C-28-21	F11 = 5C-20-13	H11 = 1D-20-45
D12 = 4D-12-21	E12 = 2D-36-45	F12 = 2D-12-37	H12 = 3D-04-29
D13 = 5D-44-21	E13 = 3D-20-29	F13 = 3D-44-37	H13 = 4D-36-29
D14 = 6D-28-05	E14 = 6D-36-13	F14 = 4D-28-21	H14 = 5D-20-13

TYPE: GENERIC, VARIABLE (0-100% AMPLIFIER OUTUT)

CAUSE: ELECTRONIC FAILURE IN THE FLUX AMPLIFIER

PLANT STATUS: 100% POWER

EFFECTS: A -- THE FLUX AMPLIFIER OUTPUT WILL GO TO THE INSTRUCTOR SPECIFIED POSITION. THE ASSOCIATED APRM WILL REFLECT THE CHANGED AVERAGE LPRM VALUE. AT 97 WATT/SQCM (77.6% SEVERITY) THE HI FLUX ANNUNCIATOR WILL ACTUATE. BELOW 3 W/SQCM (2.4% SEVERITY) THE DOWNSCALE ANNUNCIATOR WILL ACTUATE. THE LPRM STATUS LIGHTS ON THE FULL CORE DISPLAY, READINGS ON THE FOUR ROD DISPLAY, AND THE ROD BLOCK MONITOR WILL ALSO REFLECT THE EFFECTS OF THIS MALFUNCTION.

IF THE LPRM BYPASS SWITCH IS OPERATED, THE APRM READING WILL RETURN TO NORMAL.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE FLUX AMPLIFIER OUTPUT TO NORMAL. THE LPRM ANNUNCIATORS AND STATUS LIGHTS WILL CLEAR AS SOON AS THE VALUE RETURNS TO NORMAL.

CONTROL ROOM INDICATIONS:

LPRM FLUX INDICATION

APRM INDICATION

PLANT PROCESS COMPUTER

NI04

ANNUNCIATORS:

LPRM HI FLUX	CRP 905 A1 (8-4)
LPRM DOWNSCALE	CRP 905 A1 (9-4)

REF: CWD 651
GEK 26920A

NI05 APRM NOISE

VARIABLE (100% = +- 50% POWER)

A - APRM 1 NOISE

B - APRM 2 NOISE

C - APRM 3 NOISE

D - APRM 4 NOISE

E - APRM 5 NOISE

F - APRM 6 NOISE

TYPE: GENERIC, VARIABLE (100% = +- 50% POWER)

CAUSE: ELECTRONIC FAILURE IN THE AVERAGING AMPLIFIER

PLANT STATUS: ANY

EFFECTS: A -- THE AVERAGING AMPLIFIER OUTPUT WILL RANDOMLY OSCILLATE IN SPIKES ABOUT THE NORMAL VALUE. BOTH THE PERIOD AND AMPLITUDE OF THE OSCILLATIONS WILL APPEAR RANDOM, BUT THE AMPLITUDE WILL BE LIMITED BY THE INSTRUCTOR SPECIFIED SEVERITY. THESE OSCILLATIONS WILL BE INDEPENDENT OF POWER LEVEL. IF THE OUTPUT VALUE EXCEEDS ANY TRIP SETPOINTS, APPROPRIATE EVENTS WILL OCCUR.

IF THIS MALFUNCTION IS ACTIVE CONCURRENT WITH NI01, THE OSCILLATIONS WILL OCCUR ABOUT THE AMPLIFIER OUTPUT RESULTING FROM THAT MALFUNCTION.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE AVERAGING AMPLIFIER.

CONTROL ROOM INDICATIONS:

APRM RECORDERS

APRM VOLT METER

B-F SIMILAR TO MALF A.

REF: GEK 26920A

NI06 IRM NOISE

VARIABLE (100% = +- 50/125)

A - IRM 11 NOISE

B - IRM 12 NOISE

C - IRM 13 NOISE

D - IRM 14 NOISE

E - IRM 15 NOISE

F - IRM 16 NOISE

G - IRM 17 NOISE

H - IRM 18 NOISE

TYPE: GENERIC, VARIABLE (100% = +- 50/125)

CAUSE: ELECTRONIC FAILURE IN THE OUTPUT AMPLIFIER

PLANT STATUS: ANY

EFFECTS: A -- THE AMPLIFIER OUTPUT WILL RANDOMLY OSCILLATE IN SPIKES ABOUT THE NORMAL VALUE. BOTH THE PERIOD AND AMPLITUDE OF THE OSCILLATIONS WILL APPEAR RANDOM, BUT THE AMPLITUDE WILL BE LIMITED BY THE INSTRUCTOR SPECIFIED SEVERITY. THESE OSCILLATIONS WILL BE INDEPENDENT OF RANGE SWITCH POSITION AND POWER LEVEL. IF THE OUTPUT VALUE EXCEEDS ANY TRIP SETPOINTS, APPROPRIATE EVENTS WILL OCCUR.

IF THIS MALFUNCTION IS ACTIVE CONCURRENT WITH NI02, THE OSCILLATIONS WILL OCCUR ABOUT THE AMPLIFIER OUTPUT RESULTING FROM THAT MALFUNCTION.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE OUTPUT AMPLIFIER.

CONTROL ROOM INDICATIONS:

IRM RECORDERS

IRM METERS

B-H SIMILAR TO MALF A.

REF: GEK 27723B

NI07 ROD BLOCK MONITOR FAILURE

VARIABLE (0-100% AMPLIFIER OUTPUT)

A - RBM A FAILURE

B - RBM B FAILURE

TYPE: GENERIC, VARIABLE (0-100% AMPLIFIER OUTPUT)

CAUSE: ELECTRONIC FAILURE IN THE AVERAGING CIRCUIT

PLANT STATUS: ABOVE 30% POWER

EFFECTS: A -- THE OUTPUT OF THE AVERAGING CIRCUIT WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. IF THE OUTPUT EXCEEDS (0.65 W + 42%) THE HI FLUX FUNCTION WILL TRIP, ACTUATING THE ANNUNCIATOR AND INITIATING A ROD BLOCK. IF THE OUTPUT DECREASES BELOW ABOUT 3-8% THE DOWNSCALE FUNCTION WILL TRIP ACTUATING THE ANNUNCIATOR AND INITIATING A ROD BLOCK.

IF A NEW ROD IS SELECTED, THE NULLING CIRCUIT WILL FAIL ACTUATING THE NO BALANCE BISTABLE AND THE INOP ANNUNCIATOR.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE AMPLIFIER.

CONTROL ROOM INDICATIONS:

RBM POWER RECORDERS

RBM VOLT METER

RBM STATUS LIGHTS

ANNUNCIATORS:

RBM HI FLUX/INOP	CRP 905 A1 (6-4)
RBM DOWNSCALE	CRP 905 A1 (7-4)

REF: CWD 651
GEK 26920A

NI08 SPARE

NI09 APRM SETDOWN FAILURE

A - APRM CH 1 (3) SETDOWN FAILURE

B - APRM CH 5 (4) SETDOWN FAILURE

C - APRM CH 2 (3) SETDOWN FAILURE

D - APRM CH 6 (4) SETDOWN FAILURE

TYPE: GENERIC

CAUSE: RELAY 590-127D FAILS TO CHANGE STATE WHEN DEENERGIZED

PLANT STATUS: GENERATOR ON LINE

EFFECTS: A -- THIRTY SECONDS AFTER A GENERATOR LOAD REJECTION, THE CONTACTS ON RELAY 127A WILL REMAIN IN THEIR ENERGIZED POSITION. THE APRM CHANNEL 1 TRIP SETPOINT WILL NOT BE REDUCED TO 90%. THE SETDOWN ANNUNCIATOR WILL STIL ACTUATE DUE TO THE OTHER CHANNELS WHICH WILL ALL SETDOWN PROPERLY. NO OTHER EFFECTS WILL BE SEEN UNLESS REACTOR POWER EXCEEDS 90%, IN WHICH CASE APRM CHANNEL 1 WILL NOT TRIP, BUT A NORMAL SCRAM WILL OCCUR DUE TO THE OTHER CHANNELS.

ACTIVATING THIS MALFUNCTION AFTER A LOAD REJECTION HAS ALREADY OCCURRED WILL NOT CAUSE ANY EFFECTS.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF RELAY 127A.

CONTROL ROOM INDICATIONS:

APRM CHANNEL 1 TRIP SETPOINT

B-D SIMILAR TO MALF. A. APRM CHANNEL 3 SETDOWN FAILURE WILL ONLY OCCUR IF BOTH MALF. A AND C ARE ACTIVE SIMULTANEOUSLY DURING THE LOAD REJECTION. APRM CHANNEL 4 REQUIRES BOTH MALF. B AND D.

REF: CWD 600,649
GEK 26920A

NI10 STUCK SRM/IRM DETECTOR DRIVE

VARIABLE (0-100% DETECTOR INSERTION)

A - SRM 21 DETECTOR STUCK

B - SRM 22 DETECTOR STUCK

C - SRM 23 DETECTOR STUCK

D - SRM 24 DETECTOR STUCK

E - IRM 11 DETECTOR STUCK

F - IRM 12 DETECTOR STUCK

G - IRM 13 DETECTOR STUCK

H - IRM 14 DETECTOR STUCK

J - IRM 15 DETECTOR STUCK

K - IRM 16 DETECTOR STUCK

L - IRM 17 DETECTOR STUCK

M - IRM 18 DETECTOR STUCK

TYPE: GENERIC, VARIABLE (0-100% DETECTOR INSERTION)

CAUSE: BLOWN FUSES IN THE DRIVE MOTOR POWER SUPPLY

PLANT STATUS: ANY

EFFECTS: A -- WHEN SRM DETECTOR 21 DRIVE PASSES THROUGH THE SPECIFIED POSITION, IT WILL STOP AND REMAIN AT ITS PRESENT POSITION. NEUTRON FLUX INDICATION AND INTERLOCKS ASSOCIATED WITH DETECTOR POSITION WILL CONTINUE TO OPERATE PROPERLY. DETECTOR POSITION LIGHTS WILL STILL INDICATE CORRECTLY.

REMOVAL OF THIS MALFUNCTION WILL REPLACE THE FUSES AND ALLOW NORMAL OPERATION OF THE DETECTOR DRIVE.

CONTROL ROOM INDICATIONS:

DETECTOR POSITION LIGHTS

NEUTRON FLUX

B-M SIMILAR TO MALF A.

REF: CWD 617

OG01 OFF-GAS CYCLIC DRYER HEATER FAILURE

A - OFFGAS CYCLIC HEATER A FAILURE

B - OFFGAS CYCLIC HEATER B FAILURE

TYPE: GENERIC

CAUSE: HEATER CONTROL RELAY CR21 (22) FAILS ALLOWING IT TO RETURN TO ITS DE-ENERGIZED POSITION

PLANT STATUS: 100% POWER

EFFECTS: A -- IF THE CYCLIC DRYER IS IN THE HEATING PORTION OF REGENERATION, THE HEATER WILL DE-ENERGIZE. OUTLET TEMPERATURE WILL BEGIN DECREASING AND THE TEMPERATURE CONTROLLER OUTPUT WILL SATURATE HIGH. HEATER OUTLET TEMPERATURE WILL REACH EQUILIBRIUM WITH COOLER CONDENSER OUTLET TEMPERATURE, AND THE HEAT LOAD ON THE DRYER CHILLER WILL DECREASE AS THE CYCLIC DRYER COOLS. THE RESULT WILL BE THAT NOT ALL MOISTURE WILL BE DRIVEN OUT OF THE DRYER DESICCANT.

NO OTHER EFFECTS WILL BE SEEN UNTIL THE DRYER TRAIN SHIFTS AT THE END OF ITS REGENERATION CYCLE. WHEN THAT HAPPENS, THE DRYER WHICH WAS NOT COMPLETELY REGENERATED ABOVE WILL BE PLACED IN SERVICE. IT WILL FUNCTION NORMALLY FOR SOME PERIOD OF TIME DEPENDING ON HOW MUCH IT WAS REGENERATED, BUT MAY BECOME EXHAUSTED BEFORE THE END OF THE NEXT REGENERATION CYCLE. MOISTURE BREAKTHROUGH MAY BE SEEN ON THE HUMIDITY RECORDER AND THE HIGH MOISTURE ANNUNCIATOR WILL ACTUATE IF THE DEWPOINT EXCEEDS -52 DEG. EVENTUALLY THE GAS COOLER MAY BECOME PLUGGED WITH ICE, REQUIRING IT TO BE BYPASSED AND DEFROSTED USING REMOTE FUNCTIONS OGR05-08.

NOTE: THIS IS A LONG TERM TRANSIENT AND WILL REQUIRE CONSIDERABLE TIME TO ESTABLISH INITIAL CONDITIONS IN WHICH THE SECONDARY EFFECTS MAY BE SEEN.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE HEATER CONTROL RELAY. IF STILL IN THE HEATING PORTION OF THE REGENERATION CYCLE, THE HEATER CONTROL SWITCH WILL HAVE TO BE PLACED MOMENTARILY IN THE "ON" POSITION TO ENERGIZE THE HEATERS.

CONTROL ROOM INDICATIONS:

HEATER STATUS LIGHTS

OG01

TEMPERATURE CONTROLLER

TEMPERATURE RECORDER TRENDS (DECREASING)

HUMIDITY RECORDER (INCREASING)

OFF-GAS FLOW (DECREASING)

ANNUNCIATORS:

CYCLIC DRYER BEDS OUTLET GAS MOISTURE HIGH	CRP 924 A2-1 (3-3)

B -- SIMILAR TO MALF A EXCEPT DRYER TRAIN B WILL BE AFFECTED.

REF: P&ID 29174,SH 31
CWD 1422
OP 324C

NOTE: THIS MALFUNCTION NOT CERTIFIED

OG02 OFF-GAS SYSTEM EXPLOSION

- OFFGAS SYSTEM EXPLOSION IN DELAY LINE

TYPE: SPECIFIC

CAUSE: STATIC ELECTRICITY DOWNSTREAM OF THE SJAE AFTERCONDENSER

PLANT STATUS: 100% POWER

EFFECTS: THIS MALFUNCTION WILL ONLY HAVE AN EFFECT IF THE HYDROGEN CONCENTRATION DOWNSTREAM OF THE SJAE AFTER-CONDENSERS IS GREATER THAN 4%.

IF THERE IS NO OFF-GAS FLOW THROUGH THE AFTERCONDENSER TO THE HOLDUP LINE, THE DETONATION OF STAGNANT HYDROGEN WILL CAUSE ALL PRESSURE AND FLOW INDICATIONS TO SPIKE MOMENTARILY UPSCALE THEN RETURN TO NORMAL. ASSOCIATED ANNUNCIATORS WILL ACTUATE WHEN THEIR SETPOINTS ARE EXCEEDED. NO TEMPERATURE EFFECTS WILL BE OBSERVE

IF THERE IS OFF-GAS FLOW THROUGH THE AFTERCONDENSER, THE EFFECTS WILL BE SIMILAR TO THE STAGNANT CASE ABOVE EXCEPT THE FLAME FRONT WILL ESTABLISH ITSELF WITHIN THE AFTERCONDENSER. THE HEAT OF REACTION WILL INCREASE THE HEAT LOAD ON THE CONDENSATE COOLING THE AFTERCONDENSER. THIS MAY NOT BE NOTICEABLE DUE TO THE HIGH CONDENSATE SYSTEM FLOWRATE. A MORE SIGNIFICANT INDICATION WILL BE THE DECREASE IN OFF-GAS FLOWRATE TO THE HOLDUP LINE SINCE ONLY CONDENSER AIR INLEAKAGE WILL BE PRESENT.

SPECIFIC ACTIVITY IN THE OFF-GAS WILL INCREASE. THE FLAME WILL BE EXTINGUISHED IF OFF-GAS FLOW STOPS FOR MORE THAN FIVE MINUTES OR IF HYDROGEN CONCENTRATION DECREASES BELOW 4%.

IF THE XE-KR DELAY SYSTEM VALVES ARE OPEN, PRESSURE AND FLOW SPIKES WILL ALSO BE SEEN IN THAT SYSTEM.

REMOVAL OF THIS MALFUNCTION WILL REMOVE THE CAUSE OF THE DETONATION. IF A FLAME FRONT EXISTS, OFF-GAS FLOW WILL HAVE TO BE STOPPED OR HYDROGEN CONCENTRATION REDUCED BELOW 4% TO EXTINGUISH THE FLAME.

CONTROL ROOM INDICATIONS:

ALL OFF-GAS PRESSURE/FLOW METERS AND

RECORDERS SPIKE

DELAY LINE FLOW DECREASES

CONDENSATE TEMPERATURE FROM AFTERCONDENSER

OG02

INCREASES SLIGHTLY

REF: P&ID 26011
OP 522

OG03 OFF-GAS STACK ISOLATION VALVE FCV-8-5 FAILS CLOSED

- OFFGAS STACK ISOL VALVE FAILS CLOSED

CAUSE: LOOSE ELECTRICAL CONNECTION ON VALVE FSO-8-5

PLANT STATUS: 100% POWER

EFFECTS: -- THE STACK GAS ISOLATION VALVE WILL FAIL CLOSED.

PRESSURE IN THE OFF-GAS SYSTEM WILL INCREASE AS NON-CONDENSABLE GASES ACCUMULATE. AIR REMOVAL FROM THE MAIN CONDENSER WILL DECREASE, AND CONDENSER VACUUM WILL SLOWLY BEGIN TO DECREASE.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE VALVE TO RETURN TO ITS NORMAL POSITION.

CONTROL ROOM INDICATION:

OFF-GAS PRESSURES AND FLOW

STACK ACTIVITY LEVEL DECREASE

CONDENSER VACUUM DECREASE

ANNUNCIATORS:

RECOMBINER "A" A1-1 OUTLET PRESSURE HIGH	CRP 924 (5-2)

REF:

P&ID	26011
CWD	832
OP	324C

OG04 OFF-GAS -30 DEG F GLYCOL UNIT FAILS

A - OFFGAS -30 GLYCOL UNIT A LOW REFRIGERANT

B - OFFGAS -30 GLYCOL UNIT B LOW REFRIGERANT

TYPE: GENERIC

CAUSE: LOW REFRIGERANT CHARGE

PLANT STATUS: 100% POWER

EFFECTS: A -- IF THE UNIT IS IN OPERATION, ITS ABILITY TO REMOVE HEAT FROM THE GLYCOL WILL BE REDUCED TO 50% OF NORMAL ALLOWING THE GLYCOL TEMPERATURE TO BEGIN INCREASING. AFTER THE UNIT HAS RUN FOR APROXIMATELY FIVE MINUTES IT WILL TRIP DUE TO OVERHEATING. THE GLYCOL TEMPERATURES WILL THEN INCREASE MORE RAPIDLY. AS THE GLYCOL HEATS UP, THE DIFFERENTIAL TEMPERATURE OF OFF-GAS FLOWING THROUGH THE GAS COOLER WILL DECREASE. THE CHARCOAL BEDS WILL ALSO BEGIN TO HEAT UP. WHEN GAS COOLER OUTLET TEMPERATURE EXCEEDS 10 DEG. THE HIGH TEMPERATURE ANNUNCIATOR WILL ACTUATE.

IF THE GLYCOL UNIT REMAINS OFF FOR MORE THAN ABOUT FIVE MINUTES IT WILL COOL SUFFICIENTLY TO ALLOW IT TO BE RESTARTED. IT WILL THEN RUN FOR UP TO FIVE MINUTES BEFORE IT AGAIN TRIPS. HOW LONG IT RUNS WILL BE A FUNCTION OF HOW LONG IT WAS ALLOWED TO COOL.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE REFRIGERANT CHARGE AND ALLOW NORMAL OPERATION OF THE GLYCOL COOLING UNIT.

CONTROL ROOM INDICATIONS:

-30 DEG GLYCOL TEMPERATURES

GAS COOLER OUTLET TEMPERATURE

CHARCOAL BED TEMPERATURES

ANNUNCIATORS:

GAS COOLER OUTLET GAS TEMPERATURE HIGH	CRP 924 A2-1 (3-4)
CHARCOAL TANK 1A BED TEMPERATURE HIGH	CRP 924 A2-1 (4-3)

OG04

CHARCOAL TANK 2A
BED TEMPERATURE
HIGH

CRP 924 A2-1
(5-3)

B -- SIMILAR TO MALF A EXCEPT UNIT 1B WILL BE AFFECTED.

REF:

P&ID	29174,SH 32 & 34
CWD	1414
OP	324C

NOTE: THIS MALFUNCTION NOT CERTIFIED

OG05 OFF-GAS +30 DEG F GLYCOL UNIT FAILS

A - OFFGAS +30 GLYCOL UNIT A LOW REFRIGERANT

B - OFFGAS +30 GLYCOL UNIT B LOW REFRIGERANT

TYPE: GENERIC

CAUSE: LOW REFRIGERANT CHARGE

PLANT STATUS: 100% POWER

EFFECTS: A -- IF THE REFRIGERATION UNIT IS IN OPERATION, ITS ABILITY TO REMOVE HEAT FROM THE GLYCOL WILL BE REDUCED TO 50% OF NORMAL ALLOWING THE GLYCOL TEMPERATURE TO BEGIN INCREASING. AFTER THE UNIT HAS RUN FOR APPROXIMATELY FIVE MINUTES IT WILL TRIP DUE TO OVERHEATING. NO ALARMS WILL OCCUR. THE GLYCOL TEMPERATURE WILL THEN INCREASE MORE RAPIDLY. WHEN OFF-GAS TEMPERATURE LEAVING THE COOLER CONDENSER EXCEEDS 50 DEG THE HIGH TEMPERATURE ANNUNCIATOR WILL ACTUATE. THE DRYER DESICCANT WILL BE EXHAUSTED MORE RAPIDLY THAN NORMAL DUE TO HIGHER MOISTURE IN THE OFF-GAS. IF IT DEPLETES, ICE WILL ACCUMULATE IN THE GAS COOLER AND MAY BLOCK OFF-GAS FLOW REQUIRING THE USE OF REMOTE FUNCTIONS OGR05-08 TO BYPASS AND DEFROST IT.

IF THE GLYCOL UNIT REMAINS OFF FOR MORE THAN ABOUT FIVE MINUTES IT WILL COOL SUFFICIENTLY TO ALLOW IT TO BE RESTARTED. IT WILL THEN RUN FOR UP TO FIVE MINUTES BEFORE IT AGAIN TRIPS. HOW LONG IT RUNS WILL BE A FUNCTION OF HOW LONG IT WAS ALLOWED TO COOL.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE REFRIGERANT CHARGE AND ALLOW NORMAL OPERATION OF THE GLYCOL COOLING UNIT.

CONTROL ROOM INDICATIONS:

GLYCOL COOLER STATUS LIGHTS

+30 DEG GLYCOL TEMPERATURE (INCREASING)

OFF-GAS COOLER-CONDENSER OUTLET TEMPERATURE

(INCREASING)

OFF-GAS HUMIDITY (INCREASING)

OFF-GAS FLOW (DECREASING)

OG05

ANNUNCIATORS:

COOLER-CONDENSER 1-A OUTLET GAS TEMPERATURE HIGH	CRP 924 A2-1 (3-1)
CYCLIC DRYER BEDS OUTLET GAS MOISTURE HIGH	CRP 924 A2-1 (3-3)

B -- SIMILAR TO MALF A EXCEPT GLYCOL COOLING UNIT 1B WILL BE AFFECTED.

REF: P&ID 29174,SH 31 & 33
CWD 1410
OP 324C

NOTE: THIS MALFUNCTION NOT CERTIFIED

OG06 OFF-GAS FLOW OSCILLATION

VARIABLE (100% = 100% OUTPUT SWING)

A - OFFGAS A FLOW OSCILLATION

B - OFFGAS B FLOW OSCILLATION

TYPE: GENERIC, VARIABLE (100% = 100% OUTPUT SWING)

CAUSE: FLOW CONTROLLER AUTOMATIC OUTPUT SIGNAL OSCILLATION

PLANT STATUS: 100% POWER

EFFECTS: A -- THE AUTOMATIC OUTPUT SIGNAL WILL OSCILLATE ABOUT ITS PRESENT VALUE BY THE INSTRUCTOR SPECIFIED PERCENTAGE.

AT 100% SEVERITY THE VALVE WILL OPEN AND CLOSE FULLY.

THE PERIOD OF OSCILLATION WILL BE CONSTANT FROM PEAK TO PEAK. THE MAKEUP AIR VALVE V5-373 WILL FOLLOW THE OSCILLATING CONTROLLER OUTPUT CAUSING FLOW AND PRESSURE THROUGHOUT THE OFF-GAS SYSTEM TO OSCILLATE. IF FLOW DECREASES BELOW 15 SCFM OR INCREASES ABOVE 52 SCFM THE HIGH-LOW FLOW ANNUNCIATOR WILL ACTUATE. DILUTION EFFECTS MAY ALSO BE SEEN ON THE HYDROGEN ANALYZERS.

PLACING THE CONTROLLER IN MANUAL WILL ALLOW THE MAKEUP AIR VALVE TO BE POSITIONED NORMALLY.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE FLOW CONTROLLER.

CONTROL ROOM INDICATIONS:

OFF-GAS PRESSURE AND FLOW OSCILLATIONS

HYDROGEN CONCENTRATION OSCILLATIONS

ANNUNCIATORS:

OFF-GAS CONDENSER A OUTLET FLOW HIGH-LOW	CRP 924 A1-1 (3-2)

B -- SIMILAR TO MALF A EXCEPT TRAIN B WILL BE AFFECTED.

REF: P&ID 26011
OP 324C

OG07 RECOMBINER OUTLET VALVE FAILS CLOSED

A - OFFGAS RECOMBINER A OUTLET FAILS CLOSED

B - OFFGAS RECOMBINER B OUTLET FAILS CLOSED

TYPE: GENERIC

CAUSE: DIAPHRAM LEAKAGE

PLANT STATUS: 100% POWER

EFFECTS: A -- VALVE V2-663 WILL CLOSE CAUSING BLOCKAGE OF THE OFF-GAS FLOW. PRESSURE WILL INCREASE UPSTREAM OF THE VALVE, ACTUATING THE HIGH PRESSURE ANNUNCIATOR ABOVE 5 PSIG. AS FLOW DECREASES, THE MAKEUP AIR VALVE V5-373 WILL OPEN CAUSING PRESSURE TO INCREASE FASTER. BELOW 15 SCFM THE LOW FLOW ANNUNCIATOR WILL ACTUATE. WHEN PRESSURE AT THE DISCHARGE OF THE SECOND STAGE SJAE REACHES ABOUT 4 PSIG, CONDENSER VACUUM WILL BEGIN DECREASING RAPIDLY DUE TO LOSS OF THE INTERCONDENSER LOOP SEAL.

REMOVAL OF THIS MALFUNCTION WILL ALLOW NORMAL OPERATION OF THE VALVE.

CONTROL ROOM INDICATIONS:

VALVE POSITION INDICATING LIGHTS

OFF-GAS SYSTEM PRESSURES AND FLOWS

MAIN CONDENSER VACUUM

ANNUNCIATORS:

RECOMBINER "A" OUTLET PRESSURE HIGH	CRP 924 A1-1 (5-2)
OFF-GAS CONDENSER A OUTLET FLOW HIGH-LOW	CRP 924 A1-1 (3-2)

B -- SIMILAR TO MALF A EXCEPT VALVE V2-664 WILL BE AFFECTED.

REF: P&ID 26011
OP

OG08 LOSS OF OFFGAS CONDENSER COOLING WATER

- LOSS OF OFFGAS CONDNSR COOLING

TYPE: SPECIFIC

CAUSE: DIAPHRAM FAILURE ON VALVE 1-CN-702

PLANT STATUS: 100% POWER

EFFECTS: VALVE 1-CN-702 WILL CLOSE BLOCKING ALL CONDENSATE SYSTEM FLOW TO THE OFFGAS CONDENSERS. THE RECOMBINER WILL ISOLATE ON LOW COOLING FLOW AND THE LOW FLOW ANNUNCIATOR WILL ACTUATE. V2-611 AND V2-612 WILL CLOSE AND THE ISOLATED ANNUNCIATOR WILL ACTUATE.

MAKEUP AIR VALVE V2-373 OR V2-374 AND SYSTEM OUTLET VALVE V2-440 WILL CLOSE. WHEN SJAE BACKPRESSURE EXCEEDS ABOUT 4 PSIG, CONDENSER VACUUM WILL DECREASE. REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF VALVE 1-CN-702.

CONTROL ROOM INDICATIONS:

VALVE 1-CN-702 POSITION INDICATING LIGHTS

CONDENSATE PUMP DISCHARGE PRESSURE

OFFGAS SYSTEM TEMPERATURES

OFFGAS CONDENSER LEVEL CONTROLLER

ANNUNCIATORS:

OFFGAS CONDENSER A COOLING WATER LOW FLOW	CRP 924 A1 (2-2)
OFFGAS CONDENSER B COOLING WATER LOW FLOW	CRP 924 A1 (2-4)
RECOMBINERS ISOLATED	CRP 906 A2-2 (5-6)

REF: P&ID 26013
CWD 1388

PC01 LOSS OF PLANT PROCESS COMPUTER

- LOSS OF PLANT PROCESS COMPUTER

TYPE: SPECIFIC

CAUSE: SPURIOUS TRIP OF THE POWER SUPPLY TO THE VAX COMPUTERS

PLANT STATUS: ANY

EFFECTS: ALL VIDEO DISPLAYS WILL GO MAGENTA. THE PROCESS COMPUTER TYPERS WILL STOP PRINTING. ALL OTHER COMPUTER CONTROLLED FUNCTIONS WILL STOP. NO HISTORICAL DATA WILL BE RECORDED WHILE THIS MALFUNCTION IS ACTIVE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE POWER TO THE PROCESS COMPUTER. THE PROGRAM WILL RE-START AUTOMATICALLY.

REF: GEK

NOTE: THIS MALFUNCTION NOT CURRENTLY CERTIFIED

RC01 RBCCW PUMP TRIP

A - RBCCW PUMP A TRIP

B - RBCCW PUMP B TRIP

TYPE: GENERIC

CAUSE: MOTOR SHORT CIRCUIT

PLANT STATUS: 100% POWER

EFFECTS: A -- RBCCW PUMP A WILL TRIP CAUSING THE RBCCW SYSTEM FLOW AND PRESSURE TO DECREASE. FLOW WILL BE LOST TO THE FOLLOWING COMPONENTS:

REACTOR RECIRC PUMPS AND MOTORS

DRYWELL BLOWER COOLING COILS

DRYWELL EQUIP SUMP COOLER

CLEANUP PRECOAT RECIRC COOLER

CLEANUP NON-REGEN HX'S

CLEANUP RECIRC AND AUX PUMPS

FUEL POOL COOLING HX'S

SHUTDOWN COOLING PUMPS

SHUTDOWN HX'S

XE-KR BLDG GLYCOL COOLERS

RX BLDG EQUIP DRAIN TANK COOLING COIL

RADWASTE EQUIPMENT

DEPENDING ON THE PLANT STATUS AND THE EQUIPMENT IN OPERATION, THE ASSOCIATED TEMPERATURES OF THE ABOVE COMPONENTS WILL INCREASE.

ANNUNCIATORS:

REACTOR BLDG COOLING WTR PUMPS OVERLOAD OR TRIP	CRP 906 A2-1 (9-1)
REACTOR BLDG COOLING WTR PUMPS DISCHARGE PRESS LOW	CRP 906 A2-1 (9-2)

IF RBCCW PUMP B IS IMMEDIATELY STARTED, RBCCW PRESSURE AND FLOW WILL RETURN TO NORMAL AND THE ASSOCIATED TEMPERATURES OF THE ABOVE COMPONENTS WILL RETURN TO NORMAL.

IF RBCCW SYSTEM PRESSURE AND FLOW ARE NOT RETURNED TO NORMAL, THE MAJOR EFFECTS WILL BE:

HIGH DRYWELL PRESSURE DUE TO LOSS OF COOLING TO THE DRYWELL BLOWERS

RECIRC PUMP SEAL HIGH TEMPERATURES

CLEANUP SYSTEM ISOLATION DUE TO HIGH TEMPERATURES AT OUTLET OF NON-REGEN HX

LOSS OF FUEL POOL COOLING

LOSS OF COOLING TO GLYCOL COOLERS

B -- THE EFFECTS ARE THE SAME AS MALF A, EXCEPT RBCCW PUMP B IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY 50A CONTACTS TO NORMAL.

REF: P&ID 26006
CWD'S SH 148 & 149
OP 309C

RC02 RBCCW SURGE TANK MAKEUP VALVE FAILURE

VARIABLE (0-100% OF VALVE POSITION)

- RBCCW MAKEUP VALVE FAILURE

TYPE: SPECIFIC, VARIABLE (0-100% OF VALVE POSITION)

CAUSE: SOLENOID VALVE FAILURE

PLANT STATUS: 100% POWER

EFFECTS: AT 100% SEVERITY THE MAKEUP VALVE WILL FAIL TO THE FULL OPEN POSITION, CAUSING THE SURGE TANK TO FILL UP AND OVERFLOW TO RX BLDG A FLR DRAIN SUMP. MAKEUP WATER TO THE RBCCW SURGE TANK CAN BE ISOLATED BY CLOSING THE COMMON MAKEUP ISOLATION VALVE TO THE RBCCW, TBCCW & TBSCCW SURGE TANKS 1-DW-42 USING REMOTE FUNCTION CCR01

AT 0% SEVERITY THE MAKEUP VALVE WILL FAIL TO THE FULL CLOSED POSITION, PREVENTING ANY MAKEUP TO THE SURGE TANK TO REPLENISH THE WATER LOST DUE TO LEAKAGE. DEPENDING UPON THE SIZE OF THE LEAKAGE, THE SURGE TANK AND SURGE LINE WILL EVENTUALLY EMPTY WHICH WILL RESULT IN RBCCW PUMP CAVITATION. PUMP CAVITATION WILL RESULT IN A LOSS OF SYSTEM FLOW. THE EFFECTS OF LOSS OF SYSTEM FLOW ARE DESCRIBED IN MALFUNCTION RC01 EFFECTS.

ANNUNCIATORS:

REACTOR BLDG COOLING WTR SURGE TANK LEVEL HIGH	CRP 906 A2-1 (9-3)
REACTOR BLDG COOLING WATER SURGE TANK LEVEL LOW	CRP 906 A2-1 (9-4)
REACTOR BLDG COOLING WTR PUMPS DISCHARGE PRESS LOW	CRP 906 A2-1 (9-2)

MALFUNCTION REMOVAL WILL RESTORE THE SOLENOID VALVE TO NORMAL.

REF: P&ID 26006
CWD'S SH 148 & 149
OP 309C

RC03 RBCCW HX TUBE LEAK

VARIABLE (100% = 500 GPM)

A - RBCCW HX A TUBE LEAK

B - RBCCW HX B TUBE LEAK

C - RBCCW HX C TUBE LEAK

TYPE: GENERIC, VARIABLE (100% = 500 GPM)

CAUSE: TUBE FAILURE

PLANT STATUS: 100% POWER

EFFECTS: A -- THIS MALFUNCTION WILL NORMALLY RESULT IN LEAKAGE OUT OF THE RBCCW SYSTEM AND INTO THE SERVICE WATER SYSTEM.

IF THE RBCCW SYSTEM IS SHUTDOWN AND THE SERVICE WATER SYSTEM IS IN OPERATION, THE LEAKAGE WILL BE INTO THE RBCCW SYSTEM. ALSO, IF EMERG SERVICE WATER IS LINED UP TO THE RBCCW HEAT EXCHANGERS THE LEAKAGE MAY BE INTO THE RBCCW SYSTEM.

ANY LEAKAGE INTO THE RBCCW SYSTEM WILL CAUSE THE RBCCW SURGE TANK TO FILL UP AND OVERFLOW TO RX BLDG FLR DRN SUMP A.

IF THE LEAKAGE OUT OF THE RBCCW SYSTEM IS EQUAL TO OR LESS THAN THE SURGE TANK MAKEUP FLOW RATE, THE RBCCW SYSTEM WATER INVENTORY CAN BE MAINTAINED BY MAKEUP TO THE SURGE TANK.

IF THE LEAKAGE OUT OF THE RBCCW SYSTEM IS GREATER THAN THE MAKEUP FLOW RATE, THE SURGE TANK LEVEL WILL DECREASE. THE RATE OF LEVEL DECREASE WILL DEPEND UPON THE MALFUNCTION SEVERITY. EVENTUALLY THE SURGE TANK AND SURGE LINE WILL EMPTY WHICH WILL RESULT IN RBCCW PUMP CAVITATION, WHICH WILL RESULT IN A LOSS OF SYSTEM FLOW. THE EFFECTS OF LOSS OF SYSTEM FLOW ARE DESCRIBED IN MALFUNCTION RC01 EFFECTS.

IF THE AFFECTED HEAT EXCHANGER IS ISOLATED USING REMOTE FUNCTION RCR02 THE LEAKAGE OUT OF OR INTO THE RBCCW SYSTEM WILL BE STOPPED.

ANNUNCIATORS:

REACTOR BLDG COOLING WTR SURGE TANK LEVEL HIGH	CRP 906 A2-1 (9-3)

RC03

REACTOR BLDG COOLING WTR SURGE TANK LEVEL LOW	CRP 906 A2-1 (9-4)
REACTOR BLDG COOLING WTR PUMPS DISCHARGE PRESS LOW	CRP 906 A2-1 (9-2)

B -- THE EFFECTS ARE THE SAME AS MALF A EXCEPT HX B IS THE AFFECTED COMPONENT.

C -- THE EFFECTS ARE THE SAME AS MALF A EXCEPT HX C IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL REPAIR THE LEAKING TUBES.

REF: P&ID 26006
CWD'S SH 148 & 149
OP 309C

RC04 LOSS OF RBCCW FLOW TO DRYWELL COOLERS

VARIABLE (100% = COMPLETE LOSS OF FLOW)

A - DW COOLER HVH-18 LOSS OF FLOW

B - DW COOLER HVH-19 LOSS OF FLOW

C - DW COOLER HVH-20 LOSS OF FLOW

D - DW COOLER HVH-21 LOSS OF FLOW

E - DW COOLER HVH-22 LOSS OF FLOW

F - DW COOLER HVH-26 LOSS OF FLOW

G - DW COOLER HVH-27 LOSS OF FLOW

H - DW COOLER HVH-28 LOSS OF FLOW

TYPE: GENERIC, VARIABLE (100% = COMPLETE LOSS OF FLOW)

CAUSE: VALVE BLOCKAGE

PLANT STATUS: 100% POWER

EFFECTS: A -- THIS MALFUNCTION WILL RESULT IN A REDUCTION OF RBCCW FLOW TO THE DRYWELL COOLER. COOLERS HVH-18 THRU HVH-22 EACH HAVE AN INDIVIDUAL PROCESS COMPUTER LOW FLOW ALARM. THE REDUCTION OF FLOW THROUGH EACH COOLER WILL BE INDICATED BY AN INCREASE IN AIR OUTLET TEMPERATURE ON RECORDER TR1602-5.

THE LOSS OF RBCCW FLOW TO THE DRYWELL COOLERS WILL RESULT IN AN INCREASE IN DRYWELL TEMPERATURE AND PRESSURE. THE RATE AND MAGNITUDE OF THE TEMPERATURE AND PRESSURE INCREASE WILL DEPEND UPON THE NUMBER OF COOLERS AFFECTED.

ANNUNCIATORS:

NONE

APPROPRIATE ALARMS WILL ACTUATE IF HIGH DRYWELL PRESSURE SETPOINT IS REACHED.

B-H THE EFFECTS ARE THE SAME AS MALF A EXCEPT DRYWELL COOLERS 19 THRU 22 AND 26 THRU 28 ARE THE AFFECTED COMPONENTS.

MALFUNCTION REMOVAL WILL REMOVE THE BLOCKAGE FROM THE VALVE.

RC04

REF: P&ID 26006

RC05 DRYWELL COOLING FAN COIL LEAKAGE

VARIABLE (100% = 50 GPM)

A - DW COOLER HVH-18 COIL LEAKAGE

B - DW COOLER HVH-19 COIL LEAKAGE

C - DW COOLER HVH-20 COIL LEAKAGE

D - DW COOLER HVH-21 COIL LEAKAGE

E - DW COOLER HVH-22 COIL LEAKAGE

F - DW COOLER HVH-26 COIL LEAKAGE

G - DW COOLER HVH-27 COIL LEAKAGE

H - DW COOLER HVH-28 COIL LEAKAGE

TYPE: GENERIC, VARIABLE (100% = 50 GPM)

CAUSE: TUBE FAILURE

PLANT STATUS: 100% POWER

EFFECTS: A -- DRYWELL COOLING FAN COIL LEAKAGE WILL RESULT IN LEAKAGE FROM THE RBCCW SYSTEM INTO THE DRYWELL EQUIP DRAIN SUMP. WHEN THE DRYWELL EQUIP DRAIN SUMP LEVEL REACHES IT'S HIGH-HIGH SETPOINT, THE HIGH-HIGH LEVEL ALARM WILL ACTUATE. THE WATER PUMPED FROM THE SUMP WILL BE TOTALIZED ON FQ 6-2 ON PANEL 904.

THE EFFECTS OF THE LEAKAGE OUT OF THE RBCCW SYSTEM ARE DESCRIBED IN MALFUNCTION RC03 EFFECTS.

ANNUNCIATORS:

DRYWELL EQUIP DRAIN SUMP	CRP 904 (A1)
HI HI LEVEL	(4-4)
REACTOR BLDG COOLING WTR SURGE	CRP 906 (A2)
TANK LEVEL LOW	(9-4)

B-H THE EFFECTS ARE THE SAME AS MALF A EXCEPT DRYWELL COOLERS 19 THRU 22 AND 26 THRU 28 ARE THE AFFECTED COMPONENTS.

MALFUNCTION REMOVAL WILL STOP THE LEAK.

RC05

REF: P&ID 26006
P&ID 29138 SH 1
FSAR FIG 9.3.2-1
CWD'S SH 912 & 913

RC06 RBCCW DRYWELL HEADER LEAK

VARIABLE (50% = SURGE TANK MAKEUP CAPACITY)

- RBCCW DRYWELL HEADER LEAK

TYPE: SPECIFIC, VARIABLE (50% = SURGE TANK MAKEUP CAPACITY)

CAUSE: PIPE FAILURE DOWNSTREAM OF HEADER INLET CHECK VALVE V4-60

PLANT STATUS: 100% POWER

EFFECTS: THIS MALFUNCTION WILL RESULT IN LEAKAGE OF RBCCW SYSTEM WATER INTO THE DRYWELL. THE WATER WILL COLLECT IN THE DRYWELL FLOOR DRAIN SUMP. WHEN THE SUMP LEVEL INCREASES TO IT'S HIGH LEVEL SETPOINT THE LEAD SUMP PUMP WILL START. IF THE LEVEL REACHES IT'S HIGH-HIGH LEVEL SETPOINT, THE LAG PUMP WILL START AND A HIGH-HIGH LEVEL ALARM WILL ACTUATE. THE WATER PUMPED FROM THE SUMP WILL BE TOTALIZED ON FQ 6-1 ON PANEL 904.

THE EFFECTS OF THE LEAKAGE OUT OF THE RBCCW SYSTEM ARE DESCRIBED IN MALFUNCTION RC03 EFFECTS.

ANNUNCIATORS:

DRYWELL FLOOR DRAIN SUMP HI HI LEVEL	CRP 904 A-1 (3-4)
REACTOR BLDG COOLING WTR SURGE TANK LEVEL LOW	CRP 906 A2-1 (9-4)

MALFUNCTION REMOVAL WILL STOP THE LEAK.

REF: P&ID 26006
P&ID 29138 SH 1
CWD'S SH 910 & 911

RC07 SPARE

RC08 RBCCW HEADER LEAK

VARIABLE (50% = SURGE TANK MAKEUP FLOW RATE)

- RBCCW HEAT EXCHANGER OUTLET LEAK

TYPE: SPECIFIC, VARIABLE (50% = SURGE TANK MAKEUP FLOW RATE)

CAUSE: PIPE FAILURE AT THE DISCHARGE OF THE RBCCW HEAT EXCHANGERS

PLANT STATUS: 100%

EFFECTS: THIS MALFUNCTION WILL RESULT IN LEAKAGE OF RBCCW SYSTEM WATER INTO THE REACTOR BUILDING. THE WATER WILL COLLECT IN REACTOR BUILDING FLOOR DRAIN SUMP A. WHEN THE SUMP LEVEL REACHES IT'S HIGH LEVEL SETPOINT THE SUMP PUMP WILL START. IF THE SUMP LEVEL REACHES THE HIGH-HIGH LEVEL SETPOINT A HIGH-HIGH LEVEL ALARM WILL ACTUATE.

THE EFFECTS OF LEAKAGE OUT OF THE RBCCW SYSTEM ARE DESCRIBED IN MALFUNCTION RC03 EFFECTS.

ANNUNCIATORS:

REACT BLDG FLR DRAIN SUMP A HI HI	CRP 904 A-1 (1-2)
REACT BLDG COOLING WTR SURGE TANK LEVEL LOW	CRP 906 A2-1 (9-4)

MALFUNCTION REMOVAL WILL STOP THE LEAK.

REF: P&ID 26006
P&ID 29138 SH 1
CWD SH 917

RC09 LOSS OF RBCCW PUMP BREAKER CONTROL POWER

A - RBCCW PUMP A LOSS OF CONTROL POWER

B - RBCCW PUMP B LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES IN CONTROL CIRCUIT

PLANT STATUS: 100% POWER

EFFECTS: A -- WHEN THIS MALFUNCTION IS INSERTED BOTH FUSES ON THE POSITIVE SIDE OF THE CONTROL CIRCUIT WILL BLOW.

WITH THE FUSES BLOWN, THE PUMP STOP/RUN INDICATION WILL EXTINGUISH AND THE PUMP CANNOT BE STARTED IF STOPPED, OR CANNOT BE SHUT OFF IF IT IS RUNNING. ALSO THE PUMP WILL NOT TRIP IF MALFUNCTION RC01 IS INSERTED.

ANNUNCIATORS:

NONE

B -- THE EFFECTS ARE THE SAME AS MALF A EXCEPT RBCCW PUMP B IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL REPLACE THE BLOWN FUSES.

REF: CWD'S SH 148 & 149

RD01 FAILURE OF ALL RODS TO SCRAM

- ALL RODS STUCK AT PRESENT POSITIONS

TYPE: SPECIFIC

CAUSE: ALL RODS BECOME PHYSICALLY STUCK AT THEIR PRESENT POSITIONS

PLANT STATUS: 100% POWER

EFFECTS: MOVEMENT OF ALL CONTROL RODS WILL BE BLOCKED, REGARDLESS OF THE TYPE OF MOTION (REACTOR MANUAL CONTROL; NORMAL, BACKUP, OR A.R.I. SCRAM; ROD DRIFT).

IF A TRANSIENT OCCURS WHICH SHOULD RESULT IN REACTOR SCRAM, THE REACTOR WILL NOT SHUTDOWN. REACTOR POWER, PRESSURE AND WATER LEVEL WILL RESPOND TO PLANT CONDITIONS. ALL OTHER PROTECTIVE SYSTEMS WILL FUNCTION NORMALLY.

NOTE: THIS MALFUNCTION MAY ALLOW PLANT CONDITIONS TO TO GREATLY EXCEED DESIGN PARAMETERS AND MAY RESULT IN NEGATIVE TRAINING. INSTRUCTORS SHOULD USE THIS MALFUNCTION WITH DISCRETION.

REF: NUREG-0460, VOL 4

RD02 DRIVE WATER PRESSURE CONTROL VALVE FAILURE

VARIABLE (0-100% VALVE POSITION)

- ROD DRIVE PRESSURE CONTROL VALVE FAILURE

TYPE: SPECIFIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: CONTACT FAILURE IN THE CONTROL SWITCH

PLANT STATUS: 100%

EFFECTS: IF THE VALVE CLOSES FROM ITS NORMAL POSITION, DRIVE HEADER PRESSURE WILL INCREASE. COOLING WATER HEADER PRESSURE WILL DECREASE AND THEN INCREASE AS THE FLOW CONTROL VALVE OPENS TO RESTORE FLOW. THE INCREASED DRIVE HEADER PRESSURE WILL RESULT IN FASTER THAN NORMAL ROD MOTION. THIS MAY BE SEEN AS RODS ARE MANEUVERED. THE ROD MAY NOT SETTLE IN TIME, CAUSING A ROD DRIFT ALARM, OR MAY EVEN DOUBLE NOTCH. IF THE VALVE IS CLOSED SO FAR AS TO REDUCE COOLING WATER FLOW, ELEVATED DRIVE MECHANISM TEMPERATURES MAY OCCUR.

IF THE VALVE OPENS FROM ITS NORMAL POSITION, DRIVE HEADER PRESSURE WILL DECREASE. COOLING WATER HEADER PRESSURE WILL INCREASE AND THEN DECREASE AS THE FLOW CONTROL VALVE CLOSES TO RESTORE FLOW. THE DECREASED DRIVE HEADER PRESSURE WILL RESULT IN SLOWER THAN NORMAL ROD MOTION. THIS MAY BE SEEN ON ROD INSERTION AS THE ROD MAY NOT REACH THE NEXT NOTCH IN TIME AND SETTLE BACK TO ITS ORIGINAL POSITION. A ROD DRIFT ALARM MAY OCCUR. IF DRIVE PRESSURE IS SO LOW THAT THE ROD CANNOT INSERT, ROD WITHDRAWAL WILL FAIL DUE TO INABILITY OF THE COLLET FINGERS TO DISENGAGE FROM THE NOTCH.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION TO THE CONTROL SWITCH ALLOWING THE OPERATOR TO REPOSITION THE VALVE.

CONTROL ROOM INDICATIONS:

DRIVE WATER HEADER PRESSURE

FLOW CONTROLLER OUTPUT

CONTROL ROD DRIVE TEMPERATURES

CONTROL ROD SPEED

ANNUNCIATORS:

ROD DRIFT

RD02

REF:	P&ID	29122
	CWD	550
	OP	302

NOTE: THIS MALFUNCTION NOT CERTIFIED

RD03 CONTROL ROD SCRAM OUTLET VALVE LEAK

VARIABLE (100% = 20 GPM)

XXYY - SCRAM OUTLET VALVE LEAK

SPECIFY CONTROL ROD NUMBER

TYPE: GENERIC, VARIABLE (100% = 20 GPM)

CAUSE: LEAKING SCRAM OUTLET VALVE

PLANT STATUS: 100% POWER

EFFECTS: THE SCRAM OUTLET VALVE FOR THE SPECIFIED CONTROL ROD WILL LEAK WATER FROM THE OVERPISTON AREA OF THE DRIVE MECHANISM TO THE SCRAM DISCHARGE VOLUME. AT NORMAL REACTOR PRESSURE THIS WILL BE ABOUT 20 GPM. ESSENTIALLY ALL OF THIS WATER WILL COME FROM THE REACTOR VESSEL THROUGH THE INTERNAL SCRAM BALL CHECK VALVE. THE CONTROL ROD WILL DRIFT IN AT ABOUT 15 INCHES/SECOND (5 NOTCHES IN 2 SECONDS). WHEN THE ROD REACHES FULL INSERTION, INDICATION WILL GO OUT AND THE LEAKAGE WILL DECREASE TO THE NORMAL AFTER-SCRAM FLOW. THE ROD WILL BEGIN HEATING DUE TO LOSS OF NORMAL COOLING FLOW. THE ROD WILL BEGIN TO DRIFT AT ABOUT 20% SEVERITY.

IF THE LEAKAGE IS SMALL DUE TO SMALL MALFUNCTION SEVERITY OR LOW REACTOR PRESSURE, THE ONLY EFFECTS WILL BE LOSS OF MECHANISM COOLING. AT 0.3 GPM, ALL COOLING FLOW WILL BE LEAKING AND THE HEAT CONDUCTION FROM THE VESSEL WILL CAUSE A SLOW TEMPERATURE INCREASE. ABOVE 0.3 GPM FLOW FROM THE REACTOR WILL CAUSE A MORE RAPID TEMPERATURE INCREASE BUT MAY NOT CAUSE ROD MOTION, DEPENDING ON THE AMOUNT OF SEAL LEAKAGE.

IF THE SCRAM DISCHARGE VOLUME DRAIN VALVE IS CLOSED THE FLOW OF WATER INTO IT WILL CAUSE HIGH LEVEL ALARMS TO OCCUR AND WILL RESULT IN A REACTOR SCRAM.

REMOVAL OF THIS MALFUNCTION WILL STOP THE LEAKAGE.

CONTROL ROOM INDICATIONS:

CONTROL ROD POSITION

REACTOR POWER DISTRIBUTION

CONTROL ROD TEMPERATURE

RD03

ANNUNCIATORS:

ROD DRIFT	CRP 905 A2 (4-1)
CONTROL ROD DRIVE HI TEMPERATURE	CRP 905 A1 (7-2)

REF: P&ID 29122
GEI 92807,92808

RD04 CONTROL ROD DRIVE SEALS WORN

VARIABLE (100% = 20 GPM)

XXYY - ROD DRIVE SEALS WORN

SPECIFY CONTROL ROD NUMBER

TYPE: GENERIC, VARIABLE (100% = 20 GPM)

CAUSE: WORN DRIVE PISTON SEALS

PLANT STATUS: 100% POWER

EFFECTS: THE WORN SEALS WILL ALLOW LEAKAGE PAST THE DRIVE PISTON AND WILL RESULT IN SLOWER THAN NORMAL ROD SPEEDS. NO ABNORMAL EFFECTS WILL BE SEEN ON COOLING FLOW TO THE ROD.

ON ROD INSERTION, THE ROD MAY NOT REACH THE NEXT NOTCH IN TIME AND INSTEAD SETTLE BACK TO ITS ORIGINAL POSITION.

ON ROD WITHDRAWAL, IF THE ROD CANNOT MOVE DURING THE INSERT PORTION OF THE CYCLE OR IF UNDER PISTON PRESSURE IS LESS THAN 180 PSID ABOVE REACTOR PRESSURE, THE COLLET FINGERS WILL NOT DISENGAGE AND WITHDRAWAL WILL NOT OCCUR.

HIGHER THAN NORMAL DRIVE FLOW WILL BE OBSERVED AND DRIVE PRESSURE WILL DROP MORE THAN NORMAL. STALL FLOW AT NOTCH 48 WILL BE NOTICEABLY HIGHER THAN NORMAL.

ON SCRAMMING THE ROD, ROD SPEED WILL BE NOTICEABLY SLOWER THAN NORMAL. THE ACCUMULATOR WILL DISCHARGE FASTER THAN NORMAL AND THE BALL CHECK WILL SHIFT ALLOWING REACTOR PRESSURE TO CONTINUE INSERTING THE ROD. THE REACTOR PRESSURE NEEDED TO MOVE THE ROD WILL BE HIGHER THAN NORMAL. IF REACTOR PRESSURE IS LOW, THE ROD MAY NOT FULLY INSERT BEFORE THE ACCUMULATOR IS EXHAUSTED.

REMOVAL OF THIS MALFUNCTION WILL STOP THE SEAL LEAKAGE.

CONTROL ROOM INDICATIONS:

ROD DRIVE SPEEDS

DRIVE HEADER PRESSURE

DRIVE HEADER FLOW

RD04

REF: P&ID 29122
GEI 92807,92808

RD05 CONTROL ROD BLADE STUCK

XXYY - CONTROL ROD BLADE STUCK AT PRESENT POS

SPECIFY CONTROL ROD NUMBER

TYPE: GENERIC

CAUSE: MECHANICAL BINDING

PLANT STATUS: 100% POWER

EFFECTS: THE SPECIFIED CONTROL ROD WILL STICK AT ITS PRESENT POSITION. DRIVE FLOW WILL INDICATE STALL CONDITIONS IF ANY NORMAL ROD MOTION IS REQUESTED. IF THE ROD IS SCRAMMED IT WILL NOT MOVE BUT WILL PASS SEAL LEAKAGE FLOW TO THE SCRAM DISCHARGE VOLUME ALLOWING THE ACCUMULATOR TO DISCHARGE TO REACTOR PRESSURE AND THEN ALLOWING FLOW FROM THE REACTOR VESSEL.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE BLADE TO MOVE NORMALLY.

CONTROL ROOM INDICATIONS:

CONTROL ROD POSITION

DRIVE HEADER PRESSURE

DRIVE HEADER FLOW

REF: P&ID 29122
GEI 92807,92808

RD06 CONTROL ROD UNCOUPLED

XXYY - CONTROL ROD UNCOUPLED

SPECIFY CONTROL ROD NUMBER

SPECIFY CONTROL ROD NUMBER

TYPE: GENERIC

CAUSE: COUPLING SPUD FAILURE

PLANT STATUS: ANY

EFFECTS: DURING NORMAL ROD MANEUVERING THIS MALFUNCTION WILL ALLOW THE CONTROL ROD DRIVE MECHANISM TO WITHDRAW BEYOND NOTCH 48 AND SETTLE INTO THE OVERTRAVEL OUT POSITION, ACTUATING THE OVERTRAVEL ANNUNCIATOR. OTHERWISE, ROD MOTION WILL APPEAR NORMAL.

IF THIS MALFUNCTION IS ACTIVATED SIMULTANEOUSLY WITH THE STUCK BLADE MALFUNCTION RD05, THEN THE DRIVE MECHANISM CAN BE SEPARATED SIGNIFICANTLY FROM THE BLADE. SUBSEQUENT REMOVAL OF RD05 WILL ALLOW THE BLADE TO DROP TO THE CURRENT DRIVE MECHANISM POSITION AT ABOUT 2.8 FT/SEC. DURING STARTUP, THIS MAY RESULT IN A SEVERE REACTIVITY TRANSIENT AND SHORT PERIOD.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE COUPLING SPUD. BEFORE THE ROD WILL BE RECOUPLED IT MUST BE EITHER INSERTED OR INSERTED AGAINST A STUCK BLADE.

CONTROL ROOM INDICATIONS:

CORE POWER RESPONSE

ROD POSITION INDICATION AT NOTCH 48

ANNUNCIATORS:

ROD OVERTRAVEL CRP 905 A-2 (6-1)

REF: GEI 92807,92808

RD07 CONTROL ROD ACCUMULATOR LOW PRESSURE

XXYY - ACCUMULATOR LOW PRESSURE

SPECIFY CONTROL ROD NUMBER

TYPE: GENERIC

CAUSE: NITROGEN LEAK

PLANT STATUS: 100% POWER

EFFECTS: THE NITROGEN PRESSURE IN THE SPECIFIED CONTROL ROD DRIVE ACCUMULATOR WILL IMMEDIATELY DROP TO ATMOSPHERIC PRESSURE, CAUSING THE LOW PRESSURE ANNUNCIATOR TO ACTUATE. NO EFFECTS WILL BE OBSERVED ON NORMAL ROD MOTION. IF TWO OR MORE RODS ARE SELECTED, A ROD BLOCK WILL OCCUR.

IF THE ROD IS SCRAMMED, ITS ONLY DRIVING FORCE WILL BE REACTOR PRESSURE. THIS WILL CAUSE A SLOWER THAN NORMAL ROD INSERTION TIME. IF REACTOR PRESSURE IS LOWER THAN NORMAL, THE ROD SPEED MAY BE MUCH SLOWER THAN NORMAL. BELOW ABOUT 450 PSIG REACTOR PRESSURE, THE ROD WILL NOT MOVE AT ALL.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE ACCUMULATOR NITROGEN PRESSURE TO NORMAL.

CONTROL ROOM INDICATIONS:

CONTROL ROD POSITION DURING SCRAM

ANNUNCIATORS:

CRD ACCUMULATOR LO PRESSURE/HI LEVEL	CRP 905 A-2 (2-4)

REF: P&ID 29122
CWD 579
OP 302
GEI 92807,92808

RD08 SCRAM INDIVIDUAL CONTROL ROD

XXYY - SCRAM INDIVIDUAL CONTROL ROD

SPECIFY CONTROL ROD NUMBER

TYPE: GENERIC

CAUSE: SELECT ROD INSERT SWITCH FAILURE

PLANT STATUS: 100% POWER

EFFECTS: THE SPECIFIED ROD WILL SCRAM IN A NORMAL MANNER, EXACTLY AS IF THE ROD TEST SWITCH HAD BEEN PLACED IN THE SCRAM POSITION. THE ROD WILL GO TO THE OVERTRAVEL IN POSITION. REACTOR POWER WILL DECREASE DEPENDING ON ROD WORTH. THE SCRAM DISCHARGE VOLUME SHOULD NOT FILL TO THE ALARM POINT SINCE THE DRAIN VALVES DO NOT CLOSE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE POWER TO THE SCRAM PILOT VALVE SOLENOID. THE ROD WILL SETTLE TO NOTCH 00. THE ACCUMULATOR WILL RECHARGE FASTER THAN THE TIME IT REQUIRES TO CHARGE ALL ACCUMULATORS FOLLOWING A FULL SCRAM. A PERTURBATION IN THE FLOW CONTROLLER WILL BE SEEN AS FLOW IS USED FROM THE CHARGING HEADER.

CONTROL ROOM INDICATIONS:

CONTROL ROD POSITION

CORE POWER DISTRIBUTION

ANNUNCIATORS:

CRD ACCUMULATOR LO PRESSURE/HI LEVEL	CRP 905 A-2 (2-4)
ROD DRIFT	CRP 905 A-2 (4-1)

REF: P&ID 29122
CWD 562
OP 302

RD09 CRD HYDRAULIC PUMP TRIP

A - CRD PUMP A TRIP

B - CRD PUMP B TRIP

TYPE: GENERIC

CAUSE: MOTOR SHORT CIRCUIT CAUSES THE INSTANTANEOUS OVERCURRENT DEVICE 50 TO TRIP

PLANT STATUS: 100% POWER

EFFECTS: A -- IF THE PUMP IS RUNNING, OR WHEN IT IS STARTED, THE BREAKER WILL TRIP DUE TO OVERCURRENT. THE INDICATING LIGHTS WILL NOT GO OUT. THE PUMP TRIP ANNUNCIATOR WILL ACTUATE. PRESSURES IN THE CRDH SYSTEM WILL DECREASE TO SUCTION PRESSURE AND FLOWS WILL DECREASE TO ZERO. LOSS OF COOLING FLOW WILL CAUSE ALL CONTROL ROD DRIVE MECHANISM TEMPERATURES TO INCREASE DUE TO HEAT CONDUCTION FROM THE REACTOR VESSEL. WHEN ANY DRIVE TEMPERATURE EXCEEDS 250 DEGREES THE HIGH TEMPERATURE ANNUNCIATOR WILL ACTUATE. NO DRIVE SEAL DAMAGE WILL OCCUR AS THE RESULT OF HIGH TEMPERATURES, BUT MALFUNCTION RD04 MAY BE USED TO CAUSE SIMILAR EFFECTS.

ATTEMPTING TO MOVE CONTROL RODS WILL NOT PRODUCE ANY CHANGES IN FLOW OR PRESSURE AND NO ROD MOTION WILL OCCUR. THE RODS WILL STILL BE CAPABLE OF SCRAMMING NORMALLY, BUT THE ACCUMULATORS WILL NOT RECHARGE WHEN THE SCRAM IS RESET. THE ACCUMULATORS WILL SLOWLY DEPRESSURIZE AS AN EFFECT OF LOSS OF CHARGING PRESSURE.

CONTROL ROOM INDICATIONS:

CRDH SYSTEM PRESSURES AND FLOWS

CRD MECHANISM TEMPERATURES

ANNUNCIATORS:

CRD WATER PUMP A BRKR TRIPPED BY OVERLOAD	CRP 905 A-1 (6-2)
CHARGING WATER LO PRESSURE	CRP 905 A-1 (8-2)
CONTROL ROD DRIVE HI TEMPERATURE	CRP 905 A-1 (7-2)

REMOVAL OF THIS MALFUNCTION WILL RESET DEVICE 50 AND

RD09

ALLOW NORMAL OPERATION OF THE PUMP.

B -- SIMILAR TO MALF A.

REF: P&ID 29122
CWD 545
OP 302

RD10 CRD FLOW CONTROLLER FAILURE

VARIABLE (0-100% VALVE POSITION)

- CRD FLOW CONTROLLER FAILURE

TYPE: VARIABLE (0-100% VALVE POSITION)

CAUSE: FAILURE OF CONTROLLER AUTOMATIC OUTPUT SIGNAL

PLANT STATUS: 100% POWER

EFFECTS: IF THE CONTROLLER OUTPUT IS LOWER THAN NORMAL, THE FLOW CONTROL VALVE WILL CLOSE DOWN. REDUCED PRESSURES AND FLOWS WILL OCCUR. ROD DRIVE MECHANISM TEMPERATURES WILL INCREASE AND WILL ACTUATE THE HIGH TEMPERATURE ANNUNCIATOR IF ANY EXCEEDS 250 DEGREES. IF CHARGING HEADER PRESSURE DECREASES BELOW 1400 PSIG, THE LO PRESSURE ANNUNCIATOR WILL ACTUATE. ATTEMPTING TO MOVE RODS WITH LOW DRIVE PRESSURE WILL RESULT IN LOWER THAN NORMAL ROD SPEEDS. IF DRIVE PRESSURE IS BELOW ABOUT 180 PSID, NO ROD MOTION WILL OCCUR.

IF THE CONTROLLER OUTPUT IS HIGHER THAN NORMAL, THE FLOW CONTROL VALVE WILL OPEN. INCREASED PRESSURES AND FLOWS WILL OCCUR. DRIVE TEMPERATURES WILL DECREASE DUE TO INCREASED COOLING FLOW. IF COOLING PRESSURE IS TOO HIGH, RODS MAY BEGIN DRIFTING IN. HIGH DRIVE PRESSURE WILL RESULT IN HIGHER THAN NORMAL ROD SPEEDS, AND POSSIBLY DOUBLE NOTCHING IN.

PLACING THE CONTROLLER IN MANUAL WILL ALLOW THE OPERATOR TO RESTORE NORMAL FLOWS.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE FLOW CONTROLLER AUTOMATIC OUTPUT.

CONTROL ROOM INDICATIONS:

CRDH SYSTEM PRESSURES AND FLOWS

CRD MECHANISM TEMPERATURES

ROD DRIVE SPEEDS

ANNUNCIATORS:

CHARGING WATER LOW PRESSURE	CRP 905 A-1 (8-2)
CONTROL ROD DRIVE HI TEMPERATURE	CRP 905 A-1 (7-2)

RD10

ROD DRIFT

CRP 905 A-2
(6-1)

REF: P&ID 29122
OP 302

RD13 SCRAM DISCHARGE VOLUME DRAIN BLOCKAGE

VARIABLE ('00% = COMPLETE BLOCKAGE)

A - NORTH SDV DRAIN BLOCKAGE

B - SOUTH SDV DRAIN BLOCKAGE

TYPE: GENERIC, VARIABLE (100% = COMPLETE BLOCKAGE)

CAUSE: DEBRIS LODGED IN DRAIN PIPING

PLANT STATUS: 100% POWER

EFFECTS: A -- ANY WATER ENTERING THE SCRAM DISCHARGE HEADER WILL NOT DRAIN FROM THE INSTRUMENT VOLUME. WATER MAY ENTER THE SCRAM DISCHARGE HEADER AS THE RESULT OF SCRAMMED CONTROL RODS OR FROM SCRAM VALVE LEAKAGE MALFUNCTION RD03. AS LEVEL INCREASES ABOVE 8 INCHES IN THE VOLUME THE 'NOT DRAINED' ANNUNCIATOR WILL ACTUATE. WHEN LEVEL INCREASES ABOVE 14 INCHES IN THE VOLUME, A ROD OUT BLOCK WILL OCCUR. WHEN LEVEL INCREASES ABOVE 26 INCHES IN THE VOLUME, A REACTOR SCRAM WILL OCCUR.

WHEN THE SCRAM IS RESET THE DISCHARGE VOLUME WILL NOT DRAIN.

REMOVAL OF THIS MALFUNCTION WILL ALLOW NORMAL DRAINAGE OF THE DISCHARGE VOLUME.

ANNUNCIATORS:

NORTH DISCHARGE VOLUME NOT DRAINED	CRP 905 A-1 (1-3)
ROD OUT BLOCK	CRP 905 A-2 (7-1)
NORTH DISCHARGE VOLUME HIGH WATER LEVEL SCRAM	CRP 905 A-3 (2-3)

B -- SIMILAR TO MALF A.

REF: P&ID 26039
CWD 580
OP 302

RD14 SCRAM DISCHARGE ISOLATION VALVE FAILURE

VARIABLE (0-100% VALVE POSITION)

A - 1-SDV-1N VENT VALVE FAILURE

B - 1-SDV-2N VENT VALVE FAILURE

C - 1-SDV-3N DRAIN VALVE FAILURE

D - 1-SDV-4N DRAIN VALVE FAILURE

E - 1-SDV-1S VENT VALVE FAILURE

F - 1-SDV-2S VENT VALVE FAILURE

G - 1-SDV-3S DRAIN VALVE FAILURE

H - 1-SDV-4S DRAIN VALVE FAILURE

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: MECHANICAL FAILURE

PLANT STATUS: 100% POWER

EFFECTS: A,B- IF EITHER VALVE FAILS CLOSED, THE NORTH SCRAM DISCHARGE VOLUME WILL NOT VENT PROPERLY. AFTER A SCRAM HAS BEEN RESET THE DISCHARGE VOLUME WILL NOT DRAIN.

IF BOTH VALVES FAIL OPEN, THE NORTH SCRAM DISCHARGE VOLUME WILL FILL COMPLETELY AFTER A SCRAM AND OVERFLOW TO THE REACTOR BUILDING EQUIPMENT DRAIN TANK UNTIL THE SCRAM IS RESET.

C,D- IF EITHER VALVE FAILS CLOSED, THE NORTH SCRAM DISCHARGE VOLUME WILL NOT DRAIN. THE EFFECTS WILL BE SIMILAR TO THOSE DESCRIBED IN MALFUNCTION RD13.

IF BOTH VALVES FAIL OPEN, THE NORTH SCRAM DISCHARGE VOLUME WILL DISCHARGE WATER CONTINUOUSLY TO THE RBEDT FOLLOWING A SCRAM UNTIL IT IS RESET.

E,F- SIMILAR TO MALF A AND B EXCEPT THE SOUTH SCRAM DISCHARGE VENT VALVES ARE AFFECTED.

G,H- SIMILAR TO MALF C AND D EXCEPT THE SOUTH SCRAM DISCHARGE DRAIN VALVES ARE AFFECTED.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE VALVE.

RD14

CONTROL ROOM INDICATIONS:

VALVE POSITION INDICATING LIGHTS

REF:	P&ID	26039
	CWD	
	OP	302

RD15 SCRAM DISCHARGE VOLUME RUPTURE

A - NORTH SDV RUPTURE

B - SOUTH SDV RUPTURE

TYPE: GENERIC

CAUSE: FAILURE OF THE BOTTOM HEAD WELD ON THE SCRAM DISCHARGE INSTRUMENT VOLUME

PLANT STATUS: 100% POWER

EFFECTS: A -- NO EFFECTS WILL BE SEEN UNTIL THE REACTOR SCRAMS. ALL SCRAM DISCHARGE WATER (ABOUT 475 GALLONS) WILL DRAIN TO THE REACTOR BUILDING FLOOR DRAIN SUMP. NONE OF THE HIGH LEVEL ANNUNCIATORS WILL ACTUATE. WHEN ALL RODS HAVE BEEN FULLY INSERTED, ABOUT 20 GPM WILL CONTINUE TO FLOW TO THE REACTOR BUILDING DUE TO DRIVE SEAL LEAKAGE. IF MALFUNCTION RD04 IS ACTIVE THE LEAKAGE WILL BE HIGHER. AS THE WATER FLASHES TO STEAM, TEMPERATURE AND ACTIVITY IN THE AREA OF THE DISCHARGE VOLUME WILL INCREASE.

RESETTING THE SCRAM WILL STOP THE LEAKAGE UNLESS MALFUNCTION RD03 IS ACTIVE ALLOWING SCRAM VALVE LEAKAGE.

B -- SIMILAR TO MALF A EXCEPT THE SOUTH HEADER WILL BE AFFECTED.

REF: P&ID 26039
OP 302

RD16 LOSS OF CRD HYDRAULIC PUMP BREAKER CONTROL POWER

A - CRD PUMP A LOSS OF CONTROL POWER

B - CRD PUMP B LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES IN THE 125 VDC SUPPLY TO THE BREAKER CONTROL CIRCUITS

PLANT STATUS: 100%

EFFECTS: A -- THE PUMP STATUS LIGHTS WILL GO OUT. IF RUNNING, THE PUMP WILL CONTINUE TO RUN AND WILL NOT TRIP FOR ANY REASON. IF A LOW SUCTION PRESSURE CONDITION OCCURS, THAT ANNUNCIATOR WILL NOT ACTUATE. IF MALFUNCTION RD09 IS ACTIVATED CONCURRENTLY WITH THIS MALFUNCTION, THE OVERCURRENT CONDITION WILL CAUSE THE 4 KV BUS TO TRIP.

IF THE PUMP IS NOT RUNNING, IT WILL NOT START.

REMOVAL OF THIS MALFUNCTION WILL RESTORE CONTROL POWER.

CONTROL ROOM INDICATIONS:

PUMP BREAKER STATUS LIGHTS

CRDH SYSTEM PRESSURES AND FLOWS

B -- SIMILAR TO MALF A EXCEPT CRD PUMP B WILL BE AFFECTED.

REF: P&ID 29122
CWD 545
OP 302

RD17 ROD POSITION INDICATION FAILURE AT PRESENT NOTCH

XXYY - RPIS FAILS AT PRESENT POSITION

SPECIFY CONTROL ROD NUMBER

TYPE: GENERIC

CAUSE: THE REED SWITCH AT THE PRESENT POSITION FAILS CLOSED

PLANT STATUS: ANY

EFFECTS: THE SPECIFIED ROD'S POSITION INDICATION, BOTH ON THE FULL CORE DISPLAY AND ON THE FOUR-ROD MATRIX, WILL GO BLANK.

THE ROD WORTH MINIMIZER WILL RESPOND AS THOUGH THE ROD IS IN THE LAST CORRECTLY DISPLAYED POSITION. PROCESS COMPUTER DISPLAYS OF ROD POSITION (OD-7) WILL PRINT -99. CRT DISPLAY WILL SHOW "XX".

IF THE ROD IS MOVED, THE OTHER REED SWITCHES WILL WORK CORRECTLY AND THE ROD POSITION WILL BE DISPLAYED.

IF THE ROD IS MOVED BACK TO THE POSITION AT WHICH THIS MALFUNCTION WAS ACTIVATED, ITS POSITION WILL INDICATE BLANK AND THE RWM WILL INTERPRET ITS POSITION AS THE LAST CORRECTLY DISPLAYED.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE REED SWITCH TO OPERATE NORMALLY.

CONTROL ROOM INDICATIONS:

FULL CORE DISPLAY

FOUR-ROD MATRIX

PROCESS COMPUTER (OD-7, OPTION 2)

REF: GEK-27656
GEK-39445

RD18 ROD POSITION INDICATION FAILURE AT NEXT NOTCH

XXYY - RPIS FAILS AT NEXT POSITION

SPECIFY CONTROL ROD NUMBER

TYPE: GENERIC

CAUSE: THE NEXT EVEN REED SWITCH WHICH SHOULD CLOSE WILL FAIL OPEN

PLANT STATUS: ANY

EFFECTS: NO EFFECTS WILL BE SEEN UNTIL THE SPECIFIED ROD IS MOVED. WHEN THE ROD IS MOVED AND SETTLES INTO ITS NEXT EVEN POSITION, NO ROD POSITION WILL BE INDICATED ON THE FULL CORE DISPLAY OR ON THE FOUR-ROD MATRIX. WHEN THE SETTLE TIMER TIMES OUT, A ROD DRIFT ALARM WILL OCCUR (UNLESS MALFUNCTION RD17 WAS PREVIOUSLY ACTIVATED) SINCE NO EVEN REED SWITCHES ARE CLOSED AND THE ROD IS NOT SELECTED AND DRIVING.

THE ROD WORTH MINIMIZER WILL REMEMBER THE LAST VALID POSITION INDICATION. PROCESS COMPUTER DISPLAYS OF ROD POSITION WILL PRINT -99 OR SHOW "XX" ON THE CRT IF NO REED SWITCHES ARE CLOSED.

NOTE. THIS MALFUNCTION WILL AFFECT EITHER THE NEXT HIGHER OR NEXT LOWER EVEN NUMBERED REED SWITCH FOR THE SPECIFIED ROD. THE DIRECTION OF MOTION WILL DETERMINE WHICH ONE WILL BE AFFECTED. ONCE ONE OF THEM IS AFFECTED, THE OTHER WILL CONTINUE TO OPERATE NORMALLY.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE REED SWITCH TO OPERATE NORMALLY.

REF: GEK-27656
GEK-39445

RD19 CONTROL RODS FAIL TO WITHDRAW

- CONTROL RODS FAIL TO WITHDRAW

TYPE: SPECIFIC

CAUSE: CONTACT 2-3/2-4 OF THE ROD CONTROL SEQUENCE TIMER FAILS OPEN

PLANT STATUS: ANY

EFFECTS: WHEN A ROD WITHDRAWAL IS REQUESTED, RELAY 114 WILL NOT ENERGIZE AND THE INITIAL UNLATCHING ROD IN MOTION WILL NOT OCCUR. THE ROD IN INDICATING LIGHT WILL NOT ILLUMINATE. ALL OTHER CONTACTS OF THE TIMER WILL FUNCTION NORMALLY, BUT THE ROD OUT SIGNAL WILL NOT PRODUCE ANY ROD MOTION.

WHILE THE ROD OUT SIGNAL IS PRESENT, THE CONTROL ROD DRIVE SYSTEM WILL SHOW STALL FLOW. A PERTURBATION WILL BE SEEN AS THE ROD OUT STABILIZING VALVE CYCLES.

THE CONTROL ROD INSERTION SEQUENCE WILL FUNCTION NORMALLY.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE SEQUENCE TIMER.

CONTROL ROOM INDICATIONS:

ROD IN INDICATING LIGHT

CONTROL ROD POSITION

CRDH SYSTEM FLOW

REF: P&ID 29122
CWD 524
GEK 27659

RD20 FOUR ROD DISPLAY FAILS TO SHIFT

- FOUR ROD DISPLAY FAIL TO SHIFT

TYPE: SPECIFIC

CAUSE: RPIS CONTROL CARD FAILURE

PLANT STATUS: ANY

EFFECTS: WHEN SELECTING A NEW CONTROL ROD FOR OPERATION, THE FOUR ROD DISPLAY MEMORY WILL NOT UPDATE. THE PREVIOUS POSITION INFORMATION WILL CONTINUE TO BE DISPLAYED FOR THE PREVIOUSLY SELECTED ROD AND ITS ASSOCIATED RODS. THE LPRM DISPLAYS WILL ALSO NOT CHANGE BUT WILL CONTINUE TO INDICATE POWER ABOUT THE PREVIOUSLY SELECTED CONTROL ROD.

NORMAL ROD MOTION OF THE SELECTED ROD WILL BE POSSIBLE. THE FULL CORE DISPLAY WILL INDICATE CORRECT ROD POSITIONS.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL CONTROL CARD OPERATION AND THE FOUR ROD MATRIX WILL DISPLAY THE SELECTED ROD AND ASSOCIATED ROD POSITIONS AND THE ASSOCIATED LPRM VALUES.

REF: CWD 530
GEK 27659

RD21 TOTAL FAILURE OF MANUAL ROD CONTROL

- FAILURE OF MANUAL ROD CONTROL

TYPE: SPECIFIC

CAUSE: BLOWN FUSE 928/281-723

PLANT STATUS: ANY

EFFECTS: POWER TO THE ROD DRIVE BUSES WILL BE LOST PREVENTING ALL DIRECTIONAL CONTROL VALVES FROM OPERATING. THE STABILIZING VALVES WILL ALSO CLOSE CAUSING A 6 GPM INCREASE IN COOLING WATER FLOW.

ATTEMPTING TO MOVE CONTROL RODS WILL PRODUCE NORMAL LIGHT SEQUENCING AS THE TIMER OPERATES, BUT NO ROD MOTION OR PERTURBATIONS IN THE CRDH SYSTEM WILL OCCUR.

PLACING THE TIMER MALFUNCTION TEST SWITCH IN "TEST" WILL NOT TURN ON THE TEST LIGHT, NOR WILL THE "SELECT BLOCK" LIGHT COME ON AFTER TWO SECONDS.

REMOVAL OF THIS MALFUNCTION WILL RESTORE ROD DRIVE BUS POWER.

CONTROL ROOM INDICATIONS:

CONTROL ROD POSITIONS

CRDH SYSTEM FLOW

REF: P&ID 29122
CWD 525

RD22 CRD PUMP DISCHARGE HEADER RUPTURE

VARIABLE (100%=COMPLE.E PIPE BREAK)

- CRD PUMP DISCHARGE HEADER RUPTURE

TYPE: SPECIFIC, VARIABLE (100%=COMPLETE PIPE BREAK)

CAUSE: PIPE RUPTURE AT THE TEE WHERE THE TWO PUMP DISCHARGE LINES CONNECT.

PLANT STATUS: 100% POWER

EFFECTS: THE CONTROL ROD DRIVE SYSTEM WILL SUDDENLY LOSE PRESSURE AND FLOW, THE RUNNING CRD PUMP WILL TRIP DUE TO LOW SUCTION PRESSURE AS FLOW GOES TO RUNOUT CONDITIONS. NORMAL CONTROL ROD MOTION WILL NOT BE POSSIBLE. CONTROL ROD TEMPERATURES WILL BEGIN INCREASING AND THE HIGH TEMPERATURE ANNUNCIATOR WILL ACTUATE WHEN ANY EXCEEDS 250 DEG. F.

WATER FROM THE LEAK WILL APPEAR IN THE REACTOR BUILDING FLOOR DRAIN SUMP. WATER WILL CONTINUE TO TO LEAK AFTER THE PUMP HAS TRIPPED. REMOTE FUNCTIONS RDR11 AND 12 MAY BE USED TO ISOLATE THE LEAK.

CONTROL ROOM INDICATIONS:

CRDH SYSTEM PRESSURES AND FLOWS

CONTROL ROD DRIVE TEMPERATURES

REACTOR BUILDING FLOOR DRAIN SUMP

ANNUNCIATORS:

CRD WATER PUMP A LOW SUCTION PRESSURE	CRP 905 A-1 (5-2)
CRD WATER PUMP B LOW SUCTION PRESSURE	CRP 905 A-1 (5-3)
CHARGING WATER LO PRESSURE	CRP 905 A-1 (8-2)
CONTROL ROD DRIVE HI TEMPERATURE	CRP 905 A-1 (7-2)

REF: P&ID 29122,SH50
CWD 545
OP 302

RM01 PROCESS RADIATION MONITOR FAILURE

VARIABLE (0-100% OF PROCESS RANGE)

A - MS LINE LOG RAD MONITOR CH. A

B - MS LINE LOG RAD MONITOR CH. B

C - MS LINE LOG RAD MONITOR CH. C

D - MS LINE LOG RAD MONITOR CH. D

E - OG LOG RAD MONITOR CH. A

F - OG LOG RAD MONITOR CH. B

G - STACK GAS PROCESS RAD MON CH A

H - STACK GAS PROCESS RAD MON CH A

J - REFUELING FLOOR RAD MON CH. A

K - REFUELING FLOOR RAD MON CH. B

L - REACTOR BLDG VENT RAD MON CH A

M - REACTOR BLDG VENT RAD MON CH B

N - ISO CONDENSER RAD. MON. CH. A

P - ISO CONDENSER RAD. MON. CH. B

Q - CONTROL ROOM VENT RAD MONITOR

R - RBCCW RAD MONITOR

S - SW RAD MONITOR

T - RADWASTE LIQUID RAD. MONITOR

U - TURB BLDG VENT RAD LVL

V - XK BLDG VENT RAD LVL

TYPE: GENERIC, VARIABLE (0-100% OF PROCESS RANGE)

CAUSE: DETECTOR FAILURE

PLANT STATUS: ANY

EFFECTS: THE SELECTED PROCESS RADIATION MONITOR WILL FAIL TO THE INSTRUCTOR SPECIFIED PERCENT OF RANGE. IF A RANGE SWITCH IS ASSOCIATED WITH THE SELECTED PROCESS RADIATION

MONITORING CHANNEL, THE RANGE SWITCH MUST BE OPERATED TO FIND THE ON SCALE POSITION FOR THE SELECTED CHANNEL. ANY SYSTEM OR REACTOR PROTECTION FUNCTIONS ASSOCIATED WITH THE SELECTED MONITOR WILL ALARM OR TRIP AT THE NORMAL SETPOINT. MALFUNCTION VALUES WILL APPEAR ON RECORDERS ASSOCIATED WITH THE PROCESS RADIATION MONITOR SELECTED.

DEACTIVATING THE MALFUNCTION WILL RESTORE THE SELECTED PROCESS RADIATION MONITOR CHANNEL TO NORMAL OPERATION.

CONTROL ROOM INDICATIONS:

INDIVIDUAL PROCESS RADIATION CRP 910

MONITOR CHANNELS

INDIVIDUAL PROCESS RADIATION CRP 902

MONITOR RECORDERS

ANNUNCIATORS:

MAIN STEAM LINE HI RADIATION	CRP 904 A-1 (1-1)
MAIN STEAM LINE RAD MONITOR DOWNSCALE	CRP 904 A-1 (2-1)
OFFGAS HI HI RADIATION	CRP 904 A-1 (3-1)
OFFGAS HI RADIATION	CRP 904 A-1 (4-1)
OFFGAS RAD MONITOR DOWNSCALE	CRP 904 A-1 (5-1)
STACK GAS HI HI RADIATION	CRP 904 A-1 (7-1)
LIQUID PROCESS HI RADIATION	CRP 904 A-1 (8-1)
LIQUID PROCESS RAD MON DOWNSCALE/INOP	CRP 904 A-1 (9-1)
ISOLATION CONDENSER VENT HI RADIATION	CRP 904 A-1 (3-2)
ISOL. COND. VENT RAD MONITOR DNSCALE	CRP 904 A-1 (5-2)

RM01

STACK GAS HI RADIATION	CRP 904 A-1 (6-2)
STACK GAS RAD MONITOR DOWNSCALE/INOP	CRP 904 A-1 (7-2)
OFF GAS TIMER ON	CRP 904 A-1 (8-2)
XENON KRYPTON VENT RAD HIGH	CRP 903 A-4 (1-1)
XENON KRYPTON VENT DOWNSCALE OR INOP.	CRP 903 A-4 (2-1)
TURBINE BLDG VENT RAD HIGH	CRP 903 A-4 (1-2)
TURB. BLDG. VENT RAD DOWNSCALE OR INOP	CRP 903 A-4 (2-2)

REF: CWD 825-835,837

RM02 AREA RADIATION MONITOR FAILURE

VARIABLE (0-100% OF METER SCALE)

A - WEST REFUEL FLOOR ARM

B - WEST REFUEL FLOOR HI RNG ARM

C - EAST REFUEL FLOOR ARM

D - NEW FUEL STORAGE ARM

E - CLOTHING CHANGE AREA ARM

F - ISOLATION CONDENSER AREA ARM

G - CLEANUP INSTRUMENT RACK ARM

H - ISO-CONDNSR PIPING RETURN ARM

J - CLEANUP EQUIPMENT AREA ARM

K - TIP CUBICLE ARM

L - TIP DRIVE MECHANISM AREA ARM

M - DRYWELL HIGH RANGE

N - NORTH CRD HCU AREA ARM

P - SHUTDOWN PUMP CUBICLE ARM

Q - REACTOR BUILDING ACCESS ARM

R - CRD PUMP AREA ARM

S - TORUS AREA ARM

T - CONTROL ROOM ARM

U - TURB BLDG OPERATING FLOOR ARM

V - ACCESS TO MAIN COND COMPT ARM

W - CONDENSATE BOOSTER PUMP ARM

X - DECON AREA ACCESS ARM

Y - MACHINE SHOP AND WAREHOUSE ARM

Z - RADWASTE CONTROL ROOM ARM

A1 - FILTER SLUDGE PUMP CUBICLE ARM

RM02

A2 - DECON. SOLVENT PUMP AREA ARM

A3 - RADWASTE SAMPLE PUMP AREA ARM

A4 - RW STORAGE BLDG ARM

A5 - RW STORAGE BLDG DRUM DISCH ARM

A6 - RW STORAGE BLDG COMPACTOR ARM

TYPE: GENERIC, VARIABLE (0-100% OF METER SCALE)

CAUSE: DETECTOR FAILURE

PLANT STATUS: ANY

EFFECTS: THE SELECTED AREA RADIATION MONITOR WILL FAIL TO THE INSTRUCTOR SPECIFIED PERCENT OF METER SCALE. THE SELECTED AREA RADIATION MONITOR ALARM WILL ACTUATE AT THE APPROPRIATE HIGH OT LOW ALARM POINT IN ACCORDANCE WITH SUPPLIED SETPOINTS. MULTIPOINT RECORDER POINTS WILL PRINT THE MALFUNCTION VALUE.

DEACTIVATING THE MALFUNCTION WILL RESTORE THE SELECTED AREA RADIATION MONITOR TO NORMAL OPERATION.

CONTROL ROOM INDICATIONS:

INDIVIDUAL AREA RAD MON CRP 911

INDICATORS AND TRIP UNITS

ANNUNCIATORS:

REACTOR BUILDING HI RADIATION	CRP 904 A-1 (1-3)
TURBINE BUILDING HI RADIATION	CRP 904 A-1 (2-3)
RADWASTE BUILDING HI RADIATION	CRP 904 A-1 (3-3)
REFUEL FLOOR HI RADIATION	CRP 904 A-1 (4-3)
AREA RADIATION MONITOR DOWNSCALE	CRP 904 A-1 (6-3)

RM02

AREA RAD MONITOR
BYPASSED

CRP 904 A-1
(4-2)

REF: CWD 845-849

RM03 ISO-KINETIC STACK GAS SAMPLE PUMP TRIP

- ISO-KINETIC STACK GAS PP TRIP

TYPE: SPECIFIC

CAUSE: BLOWN FUSE

PLANT STATUS: ANY

EFFECTS: THE STACK GAS LOW FLOW ANNUNCIATOR WILL ALARM. COUNT RATE ON THE STACK RADIATION MONITORS WILL DECREASE SLOWLY AND THEN STABILIZE AT A LOWER CONSTANT VALUE.

DEACTIVATING THE MALFUNCTION WILL REPLACE THE FUSE AND RESTORE THE SAMPLE PUMP TO NORMAL OPERATION.

CONTROL ROOM INDICATIONS:

STACK RADIATION MONITOR RECORDER

ANNUNCIATORS:

STACK MONITORING TROUBLE	CRP 904 A-1 (9-2)

REF: CWD 830
835

RP01 REACTOR SCRAM

- SPURIOUS REACTOR SCRAM

TYPE: SPECIFIC

CAUSE: SPURIOUS UNIDENTIFIED SCRAM SIGNAL

PLANT STATUS: 100% POWER

EFFECTS: THE REACTOR WILL SCRAM IN A NORMAL MANNER AS IF SCRAM SIGNALS WERE RECEIVED FROM ALL CHANNELS. NO INDICATION WILL INDICATE WHAT THE CAUSE OF THE SCRAM WAS, AND IT WILL NOT BE ABLE TO BE RESET.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE SCRAM TO BE RESET NORMALLY.

ANNUNCIATORS:

REACTOR CHANNEL A SCRAM	CRP 905 A-2 (8-3)
REACTOR CHANNEL B SCRAM	CRP 905 A-2 (8-4)

REF: CWD 559,589
OP 502B

RP02 FAILURE OF ALL AUTOMATIC SCRAMS

- FAILURE OF ALL AUTOMATIC SCRAMS

TYPE: SPECIFIC

CAUSE: SIMULTANEOUS FAILURE OF ALL 917/590-108 RELAYS AND FAILURE OF ALL ATWS TRIP CIRCUITS

PLANT STATUS: 100% POWER

EFFECTS: CONDITIONS WHICH SHOULD CAUSE A REACTOR SCRAM WILL ACTUATE THEIR RESPECTIVE ANNUNCIATORS, BUT THE REACTOR WILL NOT SCRAM. THE OPERATOR WILL STILL BE ABLE TO MANUALLY SCRAM THE REACTOR USING THE SCRAM PUSHBUTTONS OR THE REACTOR MODE SWITCH, (THEY USE 109 RELAYS.)

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE REACTOR PROTECTION SYSTEM.

REF: CWD 559,589
OP 502A

RP03 FAILURE OF ALL AUTOMATIC SCRAMS EXCEPT ATWS

- FAILURE OF ALL AUTOMATIC SCRAMS BUT ATWS

TYPE: SPECIFIC

CAUSE: SIMULTANEOUS MECHANICAL FAILURE OF ALL 917/590-108 RELAYS

PLANT STATUS: 100% POWER

EFFECTS: CONDITIONS WHICH SHOULD CAUSE A REACTOR SCRAM ACTUATE THEIR RESPECTIVE ANNUNCIATORS, BUT THE REACTOR WILL NOT SCRAM. THE OPERATOR WILL STILL BE ABLE TO MANUALLY SCRAM THE REACTOR.

IF REACTOR PRESSURE EXCEEDS 1150 PSIG OR REACTOR LEVEL DECREASES BELOW -48 INCHES, THE ATWS SYSTEM WILL TRIP THE RECIRC PUMP MG FIELD BREAKERS AND INITIATE ARI. THIS WILL CAUSE SCRAM AIR HEADER PRESSURE TO DROP. WHEN PRESSURE FALLS BELOW ABOUT 45 PSIG, THE SCRAM VALVES WILL OPEN ALLOWING THE RODS TO SCRAM.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE REACTOR PROTECTION SYSTEM.

REF: CWD 559,589
OP 502A

RP04 LOSS OF POWER TO ATWS PANEL

A -- ATWS DIV I LOSS OF POWER

B - ATWS DIV II LOSS OF POWER

TYPE: GENERIC

CAUSE: MECHANICAL FAILURE OF POWER SUPPLY BREAKER

PLANT STATUS: 100% POWER

EFFECTS: A -- THE DIVISION I POWER SUPPLY PANELS WILL DE-ENERGIZE AND THE INDICATING LIGHTS WILL GO OUT, ALL OTHER INDICATING LIGHTS FOR DIVISION I WILL GO OUT, THE DIVISION I LEVEL AND PRESSURE METERS WILL FAIL DOWNSCALE, AND THE ATWS FAILURE ANNUNCIATOR WILL ACTUATE. NO PROTECTIVE ACTION WILL OCCUR.

IF CONDITIONS WHICH SHOULD TRIP THE ATWS SYSTEM OCCUR, NO DIVISION I PROTECTIVE ACTION WILL OCCUR. DIVISION II WILL FUNCTION NORMALLY.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE BREAKER. POWER INDICATING LAMPS WILL ILLUMINATE AND METER INDICATION WILL BE RESTORED. NO TRIPS WILL OCCUR WHEN POWER IS RESTORED UNLESS AN ACTUAL TRIP CONDITION EXISTS.

IF THE LPT FUNCTION IS BYPASSED BY REMOTE FUNCTION RPR05 OR RPR07, THAT CHANNEL MAY TRIP AT RANDOM WHEN THE MALFUNCTION IS REMOVED.

ANNUNCIATORS:

ATWS RPT FAILURE DIVISION I	CRP 905 A-3 (2-1)

B -- SIMILAR TO MALF. A.

REF: OP IC-409A
CONDEC ATWS INSTRUCTION MANUAL

RP05 LOSS OF RPMG

A - LOSS OF RPS MG A

B - LOSS OF RPS MG B

TYPE: GENERIC

CAUSE: MG SET MOTOR SUPPLY BREAKER TRIP

PLANT STATUS: 100% POWER

EFFECTS: A -- THE RPS MG SET WILL COAST DOWN AND POWER TO THE RPS BUS "A" WILL BE LOST. SUBSEQUENT EFFECTS WILL BE SIMILAR TO MALFUNCTION RP06, EXCEPT THAT THE REMOTE FUNCTION RPR01 MAY BE USED TO PROVIDE ALTERNATE POWER TO RPS BUS "A".

REMOVAL OF THIS MALFUNCTION WILL RESTART THE MG SET.

SETTING REMOTE FUNCTION RPR01 TO OFF WILL MOMENTARILY INTERRUPT POWER. THE BUS WILL THEN BE ENERGIZED FROM THE MG SET AFTER THE EPA'S ARE RESET WITH REMOTE FUNCTION RPR08.

B -- SIMILAR TO MALF A.

REF: CWD 605
CP 343

RP06 LOSS OF RPS BUS

A - LOSS OF RPS BUS A

B - LOSS OF RPS BUS B

TYPE: GENERIC

CAUSE: BUS SHORT CIRCUIT CAUSES BUS SUPPLY BREAKER TO TRIP ON OVERCURRENT

PLANT STATUS: 100% POWER

EFFECTS: A -- RPS BUS A WILL DE-ENERGIZE CAUSING RPS CHANNEL A TO TRIP (IF MSIV'S ARE OPEN WITH CONDENSER VACUUM BELOW 23", OR THE MSIV'S ARE CLOSED WITH STEAM PRESSURE BELOW 600 PSIG, FULL SCRAM WILL OCCUR). THE STANDBY GAS TREATMENT SYSTEM WILL INITIATE AND GROUP II CONTAINMENT ISOLATION WILL ISOLATE REACTOR BUILDING VENTIATION. MAIN STEAM LINE RAD MONITORS "A" AND "C", APRM'S 1, 2, AND 3 AND THE ISOLATION CONDENSER VENT RAD MONITOR WILL ALL FAIL DOWNSCALE. THE CHANNEL A GROUP I CONTAINMENT ISOLATION ANNUNCIATOR WILL ACTUATE, AND CHANNEL A APRM SETDOWN WILL OCCUR.

ATTEMPTING TO USE THE ALTERNATE FEED FROM IRP-11 (REMOTE FUNCTION RPR01) WILL NOT REENERGIZE TO RPS BUS, BUS WILL RESULT IN A MOMENTARY SPIKE IN TRANSFORMER IRP-1 CURRENT.

REMOVAL OF THIS MALFUNCTION WILL REMOVE THE SHORT AND RECLOSE THE TRIPPED BREAKER TO RESTORE POWER TO THE RPS BUS FROM THE MG SET IF IT IS AVAILABLE. IF THE MG SET IS NOT AVAILABLE AND REMOTE FUNCTION RPR01 IS SET TO BUS A, THEN ALTERNATE POWER WILL BE SUPPLIED TO RPS BUS A.

CONTROL ROOM INDICATIONS:

SCRAM CHANNELS 1 AND 4 DE-ENERGIZE (CRP 915)

STANDBY GAS TREATMENT STARTS

ANNUNCIATORS:

PRIMARY CONTAINMENT HI PRESSURE	CRP 905 A-2 (3-3)
REACTOR VESSEL HI PRESSURE	CRP 905 A-2 (4-3)

RP06

REACTOR VESSEL LO WATER LEVEL	CRP 905 A-2 (5-3)
MAIN STEAM LINE HI-HI RADIATION	CRP 905A-2 (6-3)
REACTOR NEUTRON MONITORING SYSTEM TRIP	CRP 905 A-2 (7-3)
TURBINE GENERATOR LOAD REJECTION	CRP 905 A-2 (3-4)
DISCHARGE VOLUME HI WATER LEVEL	CRP 905 A-2 (7-4)
CONDENSER LO VACUUM	CRP 905 A-2 (5-4)
MAIN STEAM ISOL VALVES NOT FULLY OPEN	CRP 905 A-2 (4-4)
TURBINE STOP VALVE CLOSURE	CRP 905 A-2 (6-4)

B -- SIMILAR TO MALF A EXCEPT SCRAM CHANNELS B WILL BE AFFECTED.

REF: CWD 605
OP 343

RP07 SELECT ROD INSERT FAILURE

A - SELECT ROD INSERT BUS FAILURE

B - SELECT ROD INSERT BUS FAILURE

TYPE: GENERIC

CAUSE: MECHANICAL FAILURE OF RELAYS 916/590-121A OR 121B

PLANT STATUS: 100% POWER

EFFECTS: A -- THE SELECT ROD INSERT WHICH SHOULD OCCUR FOLLOWING A GENERATOR LOAD REJECTION, OR AS THE RESULT OF PRESSING THE MANUAL SRI BUTTON, WILL NOT CAUSE ANY CONTROL RODS SELECTED FOR SRI TO SCRAM.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL SELECT ROD INSERT CAPABILITIES.

CONTROL ROOM INDICATIONS:

CONTROL ROD POSITIONS

B -- SAME AS MALFUNCTION A

REF: CWD 558

RR01 RECIRC MG SET MOTOR TRIP

A - RECIRC MG A MOTOR TRIP

B - RECIRC MG B MOTOR TRIP

TYPE: GENERIC

CAUSE: PHASE-TO-PHASE SHORT IN THE GENERATOR DRIVE MOTOR CAUSES ACTUATION OF THE DIFFERENTIAL OVERCURRENT TRIP DEVICE 87.

PLANT STATUS: 100% POWER

EFFECTS: A -- DRIVE MOTOR CURRENT WILL SPIKE AND THEN DROP TO ZERO AND THE "A" MOTOR-GENERATOR MOTOR SUPPLY BREAKER AND FIELD BREAKER WILL TRIP. THE FIELD BREAKER OPEN AND GENERATOR LOCKOUT ANNUNCIATORS WILL ACTUATE. THE RECIRC PUMP WILL COAST DOWN AND LOOP FLOW WILL STOP IN ABOUT 24 SEC. AFTER A SHORT TIME DELAY (2 SEC) THE DRIVE MOTOR TRIPPED ANNUNCIATOR WILL ACTUATE. WHEN PUMP DIFFERENTIAL PRESSURE DECREASES BELOW 2.7 PSID, THE LOW FLOW ANNUNCIATOR WILL ACTUATE.

THE FLOW THROUGH JET PUMPS 1 TO 10 WILL COAST DOWN TO ZERO AND THEN INCREASE SLIGHTLY AS REVERSE FLOW OCCURS.

REMOVAL OF THIS MALFUNCTION WILL RESET DEVICE 87 REMOTE FUNCTION RRR05 MUST BE USED TO RESET THE LOCKOUT RELAY.

CONTROL ROOM INDICATIONS:

DRIVE MOTOR CURRENT, PUMP MOTOR VOLTAGE, CURRENT & POWER

PUMP DIFFERENTIAL PRESSURE AND FLOW

JET PUMP FLOWS

REACTOR POWER

ANNUNCIATORS:

RECIRC PUMP "A" FIELD BREAKER OPEN	CRP 905 A3 (3-1)
RECIRC GEN. A LOCKOUT	CRP 904 A3 (2-3)
RECIRC GEN. A AUXILIARY LOCKOUT	CRP 904 A3 (3-3)

RR01

RX RECIRC LOOP A
LO FLOW

CRP 904 A2
(7-4)

B -- SIMILAR TO MALF A.

REF: CWD 430
OP 301
STARTUP TEST C.9

RR02 RECIRC PUMP LOCKED ROTOR

A - RECIRC PUMP A LOCKED ROTOR

B - RECIRC PUMP B LOCKED ROTOR

TYPE: GENERIC

CAUSE: MECHANICAL BINDING OF THE RECIRC PUMP.

PLANT STATUS: 100% POWER

EFFECTS: A -- THE RECIRC PUMP WILL STOP SUDDENLY. PUMP MOTOR CURRENT AND POWER WILL INCREASE TO STARTING VALUES. THE MG LOCKOUT RELAY WILL ACTUATE AND THE DRIVE MOTOR AND FIELD BREAKER WILL TRIP.

IF THE MALFUNCTION IS ENTERED BEFORE THE MG IS STARTED, WHEN THE FIELD BREAKER CLOSES ON A MG START, THE PUMP SHAFT WILL NOT TURN, WHEN PUMP CURRENT EXCEEDS 780 AMPS, THE MG LOCKOUT WILL ACTUATE AND THE FIELD BREAKER WILL TRIP. THE LOCKED ROTOR ANNUNCIATOR WILL ACTUATE, BUT WILL CLEAR WHEN THE BREAKER TRIPS.

PUMP MOTOR TEMPERATURES WILL INCREASE FOR SEVERAL MINUTES FOLLOWING THE PUMP TRIP, THEN BEGIN SLOWLY DECREASING.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE PUMP. THE LOCKOUT RELAY MUST BE RESET USING REMOTE FUNCTION RRR05.

CONTROL ROOM INDICATIONS:

RECIRC PUMP MOTOR CURRENT AND POWER

DRIVE MOTOR CURRENT

PUMP DIFFERENTIAL PRESSURE AND FLOW

JET PUMP FLOWS

REACTOR POWER

ANNUNCIATORS:

RX RECIRC LOOP A LO FLOW	CRP 904 A2 (7-4)
RECIRC PUMP MOTOR A LOCKED ROTOR	CRP 904 A3 (3-1)

RR02

RECIRC GEN A LOCKOUT	CRP 904 A3 (2-3)
RECIRC GEN A AUXILIARY LOCKOUT	CRP 904 A3 (3-3)
RECIRC PUMP "A" FIELD BREAKER OPEN	CRP 905 A3 (3-1)

B -- SIMILAR TO MALF. A.

REF: CWD 435
OP 301

RR03 RECIRC PUMP SHAFT BREAK

A - RECIRC PUMP A SHAFT BREAK

B RECIRC PUMP B SHAFT BREAK

TYPE: GENERIC

CAUSE: MECHANICAL FAILURE OF PUMP COUPLING

PLANT STATUS: 100% POWER

EFFECTS: A -- THE PUMP MOTOR CURRENT AND POWER WILL DROP TO NO-LOAD VALUES. LOOP FLOW WILL BEGIN DECREASING. THE TRANSIENT WILL BE SIMILAR TO MALFUNCTION RR01,

THE RECIRC MG SPEED WILL CONTINUE TO INDICATE NORMAL BUT LOOP FLOW WILL COAST DOWN AND REVERSE. FLOW COASTDOWN IS FASTER THAN IN MALFUNCTION RR01 DUE TO THE LOSS OF MOTOR INERTIA. WHEN THE PUMP DIFFERENTIAL PRESSURE DECREASES BELOW 2.7 PSI, THE LOW FLOW ANNUNCIATOR WILL ACTUATE.

CONTROL ROOM INDICATIONS:

PUMP MOTOR CURRENT AND POWER

PUMP DIFFERENTIAL PRESSURE AND FLOW

JET PUMP FLOWS

REACTOR POWER

ANNUNCIATORS:

RX RECIRC LOOP A LO FLOW	CRP 904 A2 (7-4)

REF: CWD 499
OP 301

RR04 RECIRC MG SET INCOMPLETE SEQUENCE

A - RECIRC MG A INCOMPLETE SEQUENCE

B - RECIRC MG B INCOMPLETE SEQUENCE

TYPE: GENERIC

CAUSE: CONTACT FAILURE IN RECIRC MG SET FIELD BREAKER CONTROL RELAY "X" PREVENTS CLOSING COIL FROM ENERGIZING.

PLANT STATUS: STARTUP

EFFECTS: A -- WHEN THE CONTROL SWITCH IS PLACED IN START, THE MG SET DRIVE MOTOR WILL START BUT THE FIELD BREAKER WILL NOT CLOSE. NO VOLTAGE WILL BE PRODUCED AND THE RECIRC PUMP WILL NOT START.

AFTER ABOUT 32 SECONDS THE INCOMPLETE SEQUENCE ANNUNCIATOR WILL ACTUATE AND THE MG SET LOCKOUT WILL TRIP. THE INCOMPLETE SEQUENCE ANNUNCIATOR WILL CLEAR WHEN THE DRIVE MOTOR BREAKER TRIPS, AND AFTER A TIME DELAY (2 SECONDS), THE DRIVE MOTOR TRIPPED ANNUNCIATOR WILL ACTUATE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE FIELD BREAKER. REMOTE FUNCTION RRR05 MUST BE USED TO RESET THE MG LOCKOUT.

CONTROL ROOM INDICATIONS:

FIELD BREAKER STATUS LIGHTS

MG FIELD CURRENT

ANNUNCIATORS:

RECIRC A START-UP SEQUENCE INCOMPLETE	CRP 904 A3 (4-3)
RECIRC DRIVE MOTOR A TRIPPED	CRP 904 A3 (2-1)
RECIRC GEN A LOCKOUT	CRP 904 A3 (2-3)
RECIRC GEN A AUXILIARY LOCKOUT	CRP 904 A3 (3-3)

REF: CWD 435
OP 301

RR05 RECIRC PUMP #2 SEAL FAILURE (OUTER)

VARIABLE (100% = COMPLETE SEAL FAILURE)

A - RECIRC PUMP A #2 SEAL FAILURE

B - RECIRC PUMP B #2 SEAL FAILURE

TYPE: GENERIC, VARIABLE (100% = COMPLETE SEAL FAILURE)

CAUSE: DEGRADED MECHANICAL SEALING SURFACES

PLANT STATUS: 100% POWER

EFFECTS: A -- #2 SEAL CAVITY PRESSURE WILL DECREASE TO DRYWELL PRESSURE. THE LOW SEAL LEAKAGE ANNUNCIATOR WILL ACTUATE. SEAL #1 WILL LIMIT LEAKAGE TO THE DRYWELL TO ABOUT 1 GPM. THE HIGH SEAL LEAKAGE FLOW ANNUNCIATOR WILL ACTUATE AND THE DRYWELL EQUIPMENT DRAIN SUMP WILL SHOW THE INCREASED LEAKAGE. NO SIGNIFICANT EFFECTS WILL BE OBSERVED IN THE DRYWELL ATMOSPHERE AT THIS LOW LEAK RATE.

IF THIS MALFUNCTION IS ACTIVATED WITH REDUCED SEVERITY, #2 SEAL CAVITY PRESSURE WILL STABILIZE AT AN INTERMEDIATE VALUE GREATER THAN DRYWELL PRESSURE.

IF MALFUNCTION RR06 IS ACTIVE CONCURRENTLY, LEAKAGE WILL BE LIMITED TO ABOUT 60 GPM. A FRACTION OF THIS LEAKAGE WILL FLASH TO STEAM AND ESCAPE THE OUTER SEAL LEAKOFF BARRIER PRODUCING VISIBLE EFFECTS IN THE DRYWELL ENVIRONMENT, SUCH AS INCREASED TEMPERATURES AND COOLER DRAIN FLOWS. THIS LEAKAGE WILL BE APPEAR IN THE DRYWELL FLOOR DRAIN SUMPS.

THE HIGH TEMPERATURE ANNUNCIATOR WILL ACTUATE IF SEAL COOLING WATER OUTLET TEMPERATURE EXCEEDS 125 DEG.

REMOVAL OF THIS MALFUNCTION WILL RESTORE SEAL INTEGRITY.

CONTROL ROOM INDICATIONS:

SEAL CAVITY PRESSURES

SEAL COOLING WATER OUTLET TEMPERATURE

DRYWELL DRAIN SUMP FILL RATES

DRYWELL EQUIPMENT DRAIN TANK TEMPERATURE

RR05

DRYWELL TEMPERATURE AND PRESSURE

ANNUNCIATORS:

RECIRC PUMP A LO SEAL LEAKAGE	CRP 904 A3 (9-3)
RECIRC PUMP A HI SEAL LEAKAGE FLOW	CRP 904 A3 (9-1)
RECIRC SYSTEM HI TEMPERATURE	CRP 904 A2 (9-3)

B -- SIMILAR TO MALF. A

REF: P&ID 29119,SH345
CWD 432A
OP 301

RR06 RECIRC PUMP #1 SEAL FAILURE (INNER)

VARIABLE (100% = COMPLETE SEAL FAILURE)

A - RECIRC PUMP A #1 SEAL FAILURE

B - RECIRC PUMP B #1 SEAL FAILURE

TYPE: GENERIC, VARIABLE (100% = COMPLETE SEAL FAILURE)

CAUSE: DEGRADED MECHANICAL SEALING SURFACES

PLANT STATUS: 100% POWER

EFFECTS: A -- #2 SEAL CAVITY PRESSURE WILL INCREASE TO #1 SEAL CAVITY PRESSURE. THE HIGH SEAL LEAKAGE ANNUNCIATOR WILL ACTUATE, AND THE DRYWELL EQUIPMENT DRAIN SUMP WILL SHOW INCREASED STAGING FLOW DUE TO THE HIGHER SEAL PRESSURE. SEAL COOLING WATER OUTLET TEMPERATURE WILL NOT CHANGE SINCE SEAL FLUSHING FLOW FROM THE CONTROL ROD DRIVE HYDRAULIC SYSTEM IS HIGHER THAN THE LEAKAGE FLOW.

IF THIS MALFUNCTION IS ACTIVATED WITH VERY SMALL SEVERITY, THE #2 SEAL PRESSURE WILL STABILIZE SIGNIFICANTLY LOWER THAN #1 SEAL PRESSURE AND MAY NOT ACTUATE THE HIGH LEAKAGE ANNUNCIATOR.

IF MALFUNCTION RR05 IS ACTIVE CONCURRENTLY, LEAKAGE WILL BE LIMITED TO ABOUT 60 GPM. A DIFFERENTIAL PRESSURE WILL STILL EXIST BETWEEN THE SEAL CAVITIES.

REMOVAL OF THIS MALFUNCTION WILL RESTORE SEAL INTEGRITY.

CONTROL ROOM INDICATIONS:

SEAL CAVITY PRESSURES

DRYWELL EQUIPMENT DRAIN SUMP FILL RATE

ANNUNCIATORS:

RECIRC PUMP A HI SEAL LEAKAGE	CRP 904 A3 (9-1)

B -- SIMILAR TO MALF. A

REF: P&ID 29119,SH345
CWD 432A
OP 301

RR07 RECIRC PUMP MOTOR HIGH TEMPERATURE

VARIABLE (100% = COMPLETE BLOCKAGE)

A - RECIRC PUMP A LOW COOLING FLOW

B - RECIRC PUMP B LOW COOLING FLOW

TYPE: GENERIC, VARIABLE (100% = COMPLETE BLOCKAGE)

CAUSE: PLUGGING OF THE COOLING WATER SUPPLY LINE TO THE RECIRC PUMP MOTOR

PLANT STATUS: 100% POWER

EFFECTS: A -- THE LOSS OF COOLING WATER TO THE RECIRC PUMP MOTOR WILL CAUSE THE TEMPERATURES OF THE LUBE OIL TO BEGIN INCREASING. IF LESS THAN COMPLETE BLOCKAGE, THE COOLING WATER OUTLET TEMPERATURE WILL ALSO INCREASE. MOTOR BEARING TEMPERATURES WILL INCREASE DUE TO CONDUCTION ALONG THE SHAFT, BUT PUMP SEAL TEMPERATURES WILL BE UNAFFECTED. WHEN EITHER COOLING WATER OUTLET TEMPERATURE EXCEEDS 160 DEG. THE HIGH TEMPERATURE ANNUNCIATOR WILL ACTUATE.

NO FURTHER EFFECTS WILL BE SEEN AS THE RESULT OF THIS MALFUNCTION. THE MALFUNCTIONS FOR PUMP TRIP (RR01) AND/OR LOCKED ROTOR (RR02) MAY BE USED TO SIMULATE FURTHER EFFECTS FROM THIS MALFUNCTION.

REMOVAL OF THIS MALFUNCTION WILL RESTORE COOLING WATER FLOW TO THE RECIRC PUMP COOLER. TEMPERATURES WILL RETURN TO NORMAL

CONTROL ROOM INDICATIONS:

RECIRC PUMP AND BEARING TEMPERATURE TRENDS

ANNUNCIATORS:

RECIRC SYSTEM HI TEMP	CRP 904 A2 (9-3)

B-- SIMILAR TO MALF. A

REF: P&ID 29119,SH345
CWD 466
OP 301

RR08 RECIRC SYSTEM MASTER CONTROLLER FAILURE

VARIABLE (0-100% CONTROLLER OUTPUT)

- RECIRC MASTER CONTROLLER FAILURE

TYPE: VARIABLE (0-100% CONTROLLER OUTPUT)

CAUSE: ELECTRONIC FAILURE IN MASTER CONTROLLER OUTPUT

PLANT STATUS: 100% POWER

EFFECTS: THE OUTPUT OF THE MASTER CONTROLLER WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. THE LOOP SPEED CONTROLLERS WILL RESPOND TO THE CHANGING INPUT SIGNAL AND ADJUST RECIRC PUMP MG SPEED ACCORDINGLY. THE INPUT TO THE LOOP SPEED CONTROLLERS WILL BE LIMITED TO THE RANGE OF 28-102.5%, REGARDLESS OF MASTER CONTROLLER OUTPUT.

IF THE LOOP SPEED CONTROLLERS ARE PLACED IN MANUAL, THE INDIVIDUAL RECIRC PUMP SPEEDS CAN BE RETURNED TO NORMAL.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE MASTER CONTROLLER OUTPUT TO RETURN TO ITS NORMAL VALUE.

CONTROL ROOM INDICATIONS:

RECIRC PUMP SPEED AND POWER

LOOP FLOWS, JET PUMP FLOWS, AND REACTOR POWER

REF: CWD 436
OP 301
GEK 9507A

RR09 RECIRC PUMP LOOP SPEED CONTROLLER FAILURE

VARIABLE (0-100% CONTROLLER OUTPUT)

A - RECIRC LOOP A SPEED CONTROLLER FALURE

B - RECIRC LOOP B SPEED CONTROLLER FAILURE

TYPE: GENERIC, VARIABLE (0-100% CONTROLLER OUTPUT)

CAUSE: ELECTRONIC FAILURE IN LOOP SPEED CONTROLLER OUTPUT (INDIVIDUAL M/A TRANSFER)

PLANT STATUS: 100% POWER

EFFECTS: A -- THE OUTPUT OF THE LOOP SPEED CONTROLLER WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. IF THE LOOP SPEED CONTROLLER IS IN THE BALANCE MODE, THE DEVIATION METER WILL MOVE IN THE OPPOSITE DIRECTION. THE RECIRC PUMP MG SPEED WILL RESPOND ACCORDINGLY.

IF FEEDWATER FLOW IS LESS THAN 20%, THE OUTPUT OF THE LOOP SPEED CONTROLLER WILL NOT BE LIMITED, BUT THE INPUT TO THE BASIC SPEED CONTROLLER WILL BE LIMITED TO 28%.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE OUTPUT OF THE LOOP SPEED CONTROLLER TO RETURN TO NORMAL.

CONTROL ROOM INDICATIONS:

RECIRC PUMP SPEED AND POWER

LOOP FLOWS, JET PUMP FLOWS, AND REACTOR POWER

B -- SIMULAR TO MALF. A.

REF: CWD 436
OP 301
GEK 9507A

RR10 RECIRC PUMP SPEED CONTROL FAILURE

VARIABLE (0-100% CONTROLLER OUTPUT)

A - RR PP A SPEED CNTLR FAILS INTERLOCKS B/P

B - RR PP B SPEED CNTLR FAILS INTERLOCKS B/P

TYPE: GENERIC, VARIABLE (0-100% CONTROLLER OUTPUT)

CAUSE: ELECTRONIC FAILURE IN THE BASIC SPEED CONTROLLER

PLANT STATUS: 100% POWER

EFFECTS: A -- THE OUTPUT OF THE BASIC SPEED CONTROLLER WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. THE EFFECTS WILL BE SIMILAR TO MALFUNCTION RR09, EXCEPT THAT NO LIMITS ARE PLACED ON THE RATE-OF-CHANGE OF THE SPEED CONTROLLER OUTPUT. THERE IS NO INDICATION OF THE VALUE OF THIS CONTROLLER OUTPUT, BUT ITS EFFECTS ARE SEEN THROUGH THE SCOOP TUBE AND RECIRC PUMP SPEED RESPONSE.

THIS CONTROL SIGNAL FAILURE IS DOWNSTREAM OF THE 20% SPEED LIMITER. LOW FEEDWATER FLOW WILL NOT CAUSE THE RECIRC MG TO RUNBACK IF THIS MALFUNCTION IS ACTIVE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE CONTROLLER OUTPUT TO ITS NORMAL VALUE.

CONTROL ROOM INDICATIONS:

RECIRC PUMP SPEED AND POWER

LOOP FLOWS, JET PUMP FLOWS, AND REACTOR POWER

B -- SIMILAR TO MALF. A.

REF: CWD 436
OP 301
GEK 9507A

RR11 RECIRC PUMP SCOOP TUBE LOCKUP

A - RECIRC PUMP A SCOOP TUBE LOCKUP

B - RECIRC PUMP B SCOOP TUBE LOCKUP

TYPE: GENERIC

CAUSE: LOOSE CONNECTION ON RELAY 202-60-105.

PLANT STATUS: ANY

EFFECTS: A -- THE SCOOP TUBE ON THE "A" RECIRC PUMP MG SET WILL LOCK AT ITS PRESENT POSITION. THE RED LIGHT WILL INDICATE LOCKUP. THE RECIRC PUMP WON'T RESPOND TO ANY CHANGES IN THE SPEED CONTROL SIGNAL, INCLUDING SPEED CONTROL MALFUNCTIONS.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE SCOOP TUBE LOCKUP RESET PUSHBUTTON TO RE-ENERGIZE THE 105 RELAY. THE RED LIGHT WILL GO OUT AND THE SCOOP TUBE WILL GO TO THE DEMANDED POSITION.

WHILE THIS MALFUNCTION IS ACTIVE REMOTE FUNCTION RRR01 MAY BE USED TO MANUALLY INCREASE OR DECREASE SCOOP TUBE POSITION.

CONTROL ROOM INDICATIONS:

SCOOP TUBE LOCKUP INDICATING LAMP

LOOP SPEED CONTROLLER DEVIATION

ANNUNCIATORS:

RECIRC MG A SCOOP TUBE LOCKUP	CRP 904 A3 (3-3)

B -- SIMILAR TO MALF A

REF: CWD 432
OP 301
GEK 9507A

RR12 RECIRC PUMP RUNBACK FAILURE

A - RECIRC PUMP A RUNBACK FAILURE

B - RECIRC PUMP B RUNBACK FAILURE

TYPE: GENERIC

CAUSE: WELDED 5-9 CONTACTS ON RELAY 202-60-104 A OR B PREVENT ACTUATION OF THE 20% FLOW LIMITER.

PLANT STATUS: SHUTTING DOWN

EFFECTS: A -- SPEED LIMITER 262-26A WILL BE CONTINUOUSLY BYPASSED. IF FEEDWATER FLOW IS LESS THAN 20% OR THE RECIRC PUMP DISCHARGE VALVE IS NOT FULLY OPEN, THE LIMIT OF 28% RECIRC PUMP SPEED WILL BE INDICATED BUT NOT ENFORCED. IF RECIRC PUMP SPEED IS ABOVE 28% WHEN FEEDFLOW DECREASES BELOW 20%, THE "B" RECIRC PUMP MG WILL RUNBACK, BUT "A" WILL NOT, RESULTING IN

UNBALANCED LOOP FLOWS.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE RELAY CONTACTS. IF A LIMITING CONDITION EXISTS, THE RECIRC PUMP MG WILL RUNBACK.

CONTROL ROOM INDICATIONS:

RECIRC PUMP MG SPEEDS AND LOOP FLOWS

B -- SIMILAR TO MALF A

REF: CWD 435,436
OP 301

RR13 RECIRC JET PUMP FAILURE

A - JET PUMP 1/2 RISER FAILURE

B - JET PUMP 3/4 RISER FAILURE

C - JET PUMP 5/6 RISER FAILURE

D - JET PUMP 7/8 RISER FAILURE

E - JET PUMP 9/10 RISER FAILURE

F - JET PUMP 11/12 RISER FAILURE

G - JET PUMP 13/14 RISER FAILURE

H - JET PUMP 15/16 RISER FAILURE

J - JET PUMP 17/18 RISER FAILURE

K - JET PUMP 19/20 RISER FAILURE

TYPE: GENERIC

CAUSE: BROKEN JET PUMP RISER

PLANT STATUS: 100% POWER

EFFECTS: A -- THE JET PUMP RISER WILL BREAK COMPLETELY JUST BELOW THE TOP ALLOWING THE ENTIRE RAMS HEAD ASSEMBLY TO BECOME UNATTACHED. RECIRCULATION FLOW WILL DISCHARGE DIRECTLY INTO THE DOWNCOMER REGION. THE DISTRIBUTION OF LOOP "A" FLOW WILL BE CHANGED CAUSING REDUCED FLOW TO ALL OTHER LOOP A JET PUMPS. INDICATED FLOW IN JET PUMPS 1 AND 2 WILL DROP TO ZERO AND INCREASE AS REVERSE FLOW OCCURS FROM THE LOWER PLENUM UP INTO THE DOWNCOMER.

CONTROL ROOM INDICATIONS:

JET PUMP FLOWS

REACTOR POWER

B-K SIMILAR TO MALF A

REF: P&ID 29119,SH348
GEK 9577A

RR14 ERRATIC RECIRC JET PUMP FLOW

A - JET PUMP 1 ERRATIC FLOW

B - JET PUMP 2 ERRATIC FLOW

C - JET PUMP 3 ERRATIC FLOW

D - JET PUMP 4 ERRATIC FLOW

E - JET PUMP 5 ERRATIC FLOW

F - JET PUMP 6 ERRATIC FLOW

G - JET PUMP 7 ERRATIC FLOW

H - JET PUMP 8 ERRATIC FLOW

J - JET PUMP 9 ERRATIC FLOW

K - JET PUMP 10 ERRATIC FLOW

L - JET PUMP 11 ERRATIC FLOW

M - JET PUMP 12 ERRATIC FLOW

N - JET PUMP 13 ERRATIC FLOW

P - JET PUMP 14 ERRATIC FLOW

Q - JET PUMP 15 ERRATIC FLOW

R - JET PUMP 16 ERRATIC FLOW

S - JET PUMP 17 ERRATIC FLOW

T - JET PUMP 18 ERRATIC FLOW

U - JET PUMP 19 ERRATIC FLOW

V - JET PUMP 20 ERRATIC FLOW

TYPE: GENERIC

CAUSE: LOOSE HOLDDOWN BOLT

PLANT STATUS: 100% POWER

EFFECTS: A -- THE RAMS HEAD INLET TO THE JET PUMP MIXER SECTION WILL BECOME LOOSE CAUSING IT TO CHANGE ITS ORIENTATION. THE MISDIRECTED FLOW WILL CAUSE RANDOM OSCILLATION ABOUT THE NORMAL VALUE FOR JET PUMP FLOW. NO SIGNIFICANT

RR14

EFFECTS WILL BE SEEN IN OVERALL LOOP FLOW OR CORE FLOW.

CONTROL ROOM INDICATIONS:

JET PUMP FLOWS

B-V SIMILAR TO MALF. A

REF: P&ID 29119,SH348
GEK 9577A

RR15 REACTOR VESSEL HEAD VENT LEAK

VARIABLE (100% = COMPLETE BREAK)

- REACTOR VESSEL HEAD VENT LEAK

TYPE: VARIABLE (100% = COMPLETE BREAK)

CAUSE: PIPING FAILURE ON THE REACTOR SIDE OF CONDENSING CHAMBER 11 (1" PIPE BREAK).

PLANT STATUS: 100% POWER

EFFECTS: THE CONDENSING CHAMBER WILL DEPRESSURIZE THE REFERENCE LEG OF THE WIDE RANGE FLOODUP GEMAC LEVEL INSTRUMENT. INDICATED LEVEL WILL FAIL COMPLETELY UPSCALE.

STEAM FROM THE VESSEL DOME WILL ESCAPE INTO THE DRYWELL DOME AREA ABOVE THE REFUELING BELLOWS.

THIS AREA WILL PRESSURIZE AND BLOW STEAM INTO THE REST OF DRYWELL WITH RESULTS SIMILAR TO OTHER SMALL STEAM LEAKS.

IF THIS MALFUNCTION IS ACTIVATED WITH NO REACTOR PRESSURE, NO EFFECTS WILL BE SEEN UNTIL PRESSURE IS RAISED.

ACTIVATION AT SMALL SEVERITIES OR WITH LOW REACTOR PRESSURE WILL PRODUCE HIGHER THAN NORMAL LEVEL INDICATION BUT MAY NOT CAUSE THE INSTRUMENT TO FAIL FULLY UPSCALE.

CONTROL ROOM INDICATIONS:

WIDE RANGE FLOODUP LEVEL INDICATION

REF: P&ID 29119,SH348
CWD 500

RR16 RECIRC LOOP BREAK

VARIABLE (100% = COMPLETE PIPE BREAK)

A - RECIRC LOOP A BREAK

B - RECIRC LOOP B BREAK

TYPE: GENERIC, VARIABLE (100% = COMPLETE PIPE BREAK)

CAUSE: PIPE FAILURE UPSTREAM OF THE RECIRC PUMP SUCTION VALVE

PLANT STATUS: 100% POWER

EFFECTS: A -- THE SUDDEN FAILURE OF THE RECIRC LOOP PIPING WILL ALLOW WATER TO FLOW INTO THE DRYWELL FROM BOTH SIDES OF THE BREAK. WATER WILL FLASH TO STEAM, PRESSURIZING THE DRYWELL TO A PEAK PRESSURE OF LESS THAN ABOUT 42 PSIG IN ABOUT 4-5 SECONDS. CORE POWER WILL DECREASE IMMEDIATELY DUE TO VOID FORMATION AND THE REACTOR WILL SCRAM ON HIGH DRYWELL PRESSURE IN LESS THAN ONE SECOND.

INDICATED LOW LOW WATER LEVEL WILL OCCUR IN ABOUT 4 SECONDS AND THE MSIV'S WILL ISOLATE. ALL ECCS SYSTEMS WILL FUNCTION TO MAINTAIN CORE COOLING.

THE STEAM IN THE DRYWELL WILL DISPLACE ALL NON-CONDENSIBLE GASES INTO THE TORUS AND THE CONDENSATION OF STEAM WILL RAISE SUPPRESSION POOL WATER TEMPERATURE TO ABOUT 100 DEG. VESSEL PRESSURE WILL REMAIN NEAR NORMAL FOR ABOUT 4-5 SEC. DURING THE INITIAL PHASE OF BLOWDOWN. AS VESSEL BLOWDOWN SLOWS THE DRYWELL PRESSURE WILL APPROACH TORUS PRESSURE AT ABOUT 25 PSIG IN ABOUT 30-40 SECONDS. AS THE STEAM CONDENSES, BOTH PRESSURES WILL DECREASE TO A MINIMUM OF ABOUT 8-10 PSIG IN ABOUT 30 MINUTES.

WATER LEVEL WILL RECOVER AND STABILIZE AT OR ABOVE 2/3 CORE COVERAGE ABOUT 90-100 SECONDS INTO THE ACCIDENT DEPENDING ON INJECTION COMBINATIONS AND FLOW RATES.

ACTUATION OF THIS MALFUNCTION AT SMALL SEVERITY OR LOW REACTOR PRESSURE WILL PRODUCE SUBSTANTIALLY DIFFERENT RESULTS. WITH NO PRESSURE, THE VESSEL SHOULD TAKE 2-3 MINUTES TO DRAIN ALL THE WATER ABOVE THE JET PUMP RISERS AND IN THE DOWNCOMER AND ONLY MINOR EFFECTS IF ANY, SHOULD BE SEEN ON DRYWELL PRESSURE.

RR16

CONTROL ROOM INDICATIONS:

DRYWELL/TORUS PRESSURE/TEMPERATURE

REACTOR LEVEL/PRESSURE

ANNUNCIATORS:

DRYWELL HI PRESSURE	CRP 903 A1 (2-3)
DRYWELL PRESS HIGH	CRP 904 A2 (4-1)
PRIMARY CONTAINMENT HIGH PRESSURE	CRP 905 A2 (3-3)

B -- SIMILAR TO MALF. A.

REF: P&ID 29119, SH248
OP 506
FSAR CH 5 & 6

RR17 LOSS OF RECIRC MG SET DRIVE MOTOR BKR CONTROL PWR

A - RECIRC MG A LOSS OF CONTROL POWER

B - RECIRC MG B LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES IN THE 125 VDC CONTROL POWER SUPPLY.

PLANT STATUS: 100% POWER

EFFECTS: A -- THE DRIVE MOTOR BREAKER INDICATING LIGHTS WILL GO OUT. THE MG SET WILL CONTINUE TO RUN, INDICATING NORMAL MOTOR AMPS. THE BREAKER WILL NOT RESPOND TO ANY CONTROL SIGNALS EITHER MANUAL OR AUTOMATIC.

IF MALFUNCTION RR01 IS ACTIVATED CONCURRENTLY WITH THIS MALFUNCTION, THE OVERCURRENT CONDITION WILL TRIP THE 4KV BUS. THE LOCKOUT DEVICE WILL ACTUATE NORMALLY, BUT THE DRIVE MOTOR BREAKER WILL NOT TRIP.

CONTROL REMOVAL OF THIS MALFUNCTION WILL RESTORE POWER.

CONTROL ROOM INDICATIONS:

MG MOTOR BREAKER STATUS LIGHTS

B -- SIMILAR TO MALF. A

REF: CWD 430
OP 301

RR18 RPV INSTRUMENT LINE BREAK (REFERENCE TAP)

VARIABLE (100% = COMPLETE BREAK)

A - RPV INST REFERENCE TAP A BREAK

B - RPV INST REFERENCE TAP B BREAK

TYPE: GENERIC, VARIABLE (100% = COMPLETE BREAK)

CAUSE: PIPE FAILURE AT THE TEE CONNECTING THE REACTOR VESSEL TO THE CONDENSING CHAMBERS (1 1/2" PIPE)

PLANT STATUS: 100% POWER

EFFECTS: A -- PRESSURE IN CONDENSING CHAMBERS 12A AND 13A WILL BE VENTED TO THE CONTAINMENT. THE COLD REFERENCE LEG BELOW 13A WILL NOT FLASH, BUT ALL LEVEL AND PRESSURE INSTRUMENTS WILL RESPOND TO THE REDUCED REFERENCE PRESSURE. THE HOT REFERENCE LEG BELOW 12A WILL FLASH, BUT THE AUXILIARY HEAD CHAMBER WILL KEEP IT FULL. FLOW WILL ALSO OCCUR FROM THE VARIABLE LEG INTO THE 12A CONDENSING CHAMBER WHICH WILL AFFECT THE INSTRUMENTS WHICH SENSE THE PRESSURE AT PENETRATION N-15A. PRESSURES IN THE REFERENCE LEG PIPING AND IN THE VARIABLE LEG PIPING WILL STABILIZE JUST HIGHER THAN CONTAINMENT PRESSURE AS THE REACTOR WATER BLOWS THROUGH THE VARIABLE LEG PIPING. ALL AFFECTED LEVEL INSTRUMENTS WILL INDICATE FULLY UPSCALE, EXCEPT THE WIDE RANGE "FLOODUP" GEMAC WHICH WILL INDICATE FULLY DOWNSCALE.

STEAM WILL ALSO LEAK FROM THE REACTOR SIDE OF THE BREAK. THE CONTAINMENT WILL RESPOND AS DESCRIBED FOR A SMALL STEAM LEAK.

THE EFFECTS FOR INTERMEDIATE SEVERITIES WILL BE SIMILAR, EXCEPT THAT THE PRESSURE DISTURBANCE IN THE VARIABLE LEG PIPING WILL NOT BE AS SEVERE.

IF THE REACTOR VESSEL PRESSURE IS LESS THAN CONTAINMENT PRESSURE, NO EFFECTS WILL BE SEEN FROM THIS MALFUNCTION UNTIL THE REACTOR IS HEATED UP.

IF REACTOR LEVEL IS ABOVE THE REFERENCE TAP, WATER WILL LEAK TO THE CONTAINMENT.

CONTROL ROOM INDICATIONS:

ALL CHANNEL "A" AND "C" LEVEL AND PRESSURE INDICATIONS
REACTOR FEED PUMPS TRIP

RR18

ANNUNCIATORS:

REACTOR PRESS LOW	CRP 903 A1 (1-4)
RPV TURBINE TRIP A HI WATER LEVEL	CRP 905 A-2 (8-1)
REACTOR HI/LO LEVEL	CRP 905 A-2 (2-1)
HI RX WTR LVL FEED PUMP TRIP LOGIC ACTUATED	CRP 905 A-3 (4-1)

B -- EFFECTS SIMILAR TO MALF. A EXCEPT THE WIDE RANGE FLOOD-UP LEVEL INDICATOR WILL NOT BE AFFECTED.

REF: P&ID 29119,SH348
CWD 505,780,661

RR19 RPV INSTRUMENT LINE BREAK (VARIABLE TAP)

VARIABLE (100% = COMPLETE BREAK)

A - RVP INST VARIABLE TAP A BREAK

B - RVP INST VARIABLE TAP B BREAK

TYPE: GENERIC, VARIABLE (100% = COMPLETE BREAK)

CAUSE: PIPE FAILURE AT THE REACTOR VESSEL PENETRATION (2" PIPE).

PLANT STATUS: 100% POWER

EFFECTS: A -- THE BREAK WILL ALLOW ALL OF THE VARIABLE LEG PIPING TO DEPRESSURIZE. STEAM PRESSURE WILL FORCE THE WATER OUT OF THE VARIABLE LEG BELOW CONDENSING CHAMBER 12A. THE REFERENCE LEG PRESSURE WILL DECREASE TO SOME VALUE JUST HIGHER THAN CONTAINMENT PRESSURE AS STEAM BLOWS THROUGH THE CONDENSING CHAMBER. THE PRESSURE SENSED FROM CONDENSING CHAMBER 13A WILL ALSO DECREASE TO ABOUT THE SAME VALUE. ALL AFFECTED LEVEL INSTRUMENTS WILL INDICATE FULLY DOWNSCALE.

WATER WILL ALSO LEAK FROM THE REACTOR SIDE OF THE BREAK. THE CONTAINMENT WILL RESPOND AS DESCRIBED FOR A SMALL LEAK, HOWEVER DIVISION I SYSTEMS WILL SEE THE LOW LEVEL AND RESPOND ACCORDINGLY.

THE EFFECTS FOR INTERMEDIATE SEVERITIES WILL BE SIMILAR EXCEPT THAT THE PRESSURE DISTURBANCE IN THE REFERENCE LEG PIPING WILL NOT BE AS SEVERE. FOR SMALL SEVERITIES THE 12A VARIABLE LEG MAY NOT DRAIN COMPLETELY, ESPECIALLY IF THE REACTOR VESSEL IS NOT PRESSURIZED.

IF THE REACTOR LEVEL IS ABOVE THE REFERENCE LEG PENETRATION, THE LEAK WILL STILL PRODUCE A LOWER PRESSURE IN THE VARIABLE LEG. LEVEL INSTRUMENTS WHICH SHOULD BE INDICATING FULLY UPSCALE WILL STILL INDICATE FULLY DOWNSCALE.

CONTROL ROOM INDICATIONS:

ALL CHANNEL "A" AND "C" LEVEL AND PRESSURE INDICATIONS

REACTOR SCRAM (CHANNELS "A" & "B" TRIP)

DRYWELL COOLERS TRIP

EMERGENCY DIESEL GENERATOR STARTS

RR19

GAS TURBINE GENERATOR STARTS

MAIN GENERATOR LOCKOUT

FWCI INITIATES

ATWS INITIATES AFTER 9 SECOND TIME DELAY

ANNUNCIATORS:

REACTOR HI/LO LEVEL	CRP 905 A-2 (2-1)
REACTOR VESSEL LO WATER LEVEL	CRP 905 A-2 (5-3)
REACTOR CHANNEL "A" SCRAM	CRP 905 A-2 (8-3)
TURBINE GENERATOR LOAD REJECTION	CRP 905 A-2 (3-4)
ATWS RPT TRIP DIVISION I	CRP 905 A-3 (1-1)
REACTOR VESSEL CHANNEL A LO LO WATER LEVEL	CRP 905 A-1 (1-2)
REACTOR VESSEL CHANNEL B	CRP 905 A-1 (2-2)
ECCS LOW-LOW WATER LEVEL	CRP 903 A-2 (7-4)

B -- SIMILAR TO MALF. A EXCEPT THE WIDE RANGE FLOOD-UP LEVEL INDICATION IS NOT AFFECTED.

REF: P&ID 29119,SH348
CWD 740,232

RR20 RPV INSTRUMENT LINE BREAK (CALIBRATED J.P.)

VARIABLE (100%=COMPLETE BREAK)

A - CALIB JP 6 INST LINE BREAK

B - CALIB JP 16 INST LINE BREAK

TYPE: GENERIC, VARIABLE (100%=COMPLETE BREAK)

CAUSE: FAILURE OF THE CALIBRATED JET PUMP HIGH PRESSURE SIDE INSTRUMENT PIPING INSIDE THE DRYWELL

PLANT STATUS: 100% POWER

EFFECTS: A -- THE BREAK WILL ALLOW ALL OF THE HIGH PRESSURE SIDE INSTRUMENT PIPING TO DEPRESSURIZE. INDICATED CALIBRATED JET PUMP FLOW WILL FAIL UPSCALE.

SINCE THIS LINE ALSO SERVES AS THE REFERENCE LEG FOR THE WIDE RANGE YARWAY AND WIDE RANGE ACCIDENT GEMAC LEVEL TRANSMITTERS, THEY WILL FAIL DOWNSCALE ALSO. NO OTHER EFFECTS WILL BE OBSERVED UNLESS ATTEMPTING TO INITIATE CONTAINMENT COOLING. WITH W.R. YARWAY INDICATING LESS THAN 2/3 CORE HEIGHT, CONTAINMENT COOLING CAN NOT BE PERFORMED ON THE AFFECTED SIDE DURING AN ACCIDENT, UNLESS THE CONTAINMENT SPRAY SECOND KEY IS IN MANUAL OVERRIDE.

WATER WILL ALSO LEAK FROM THE REACTOR SIDE OF THE BREAK. THE CONTAINMENT WILL RESPOND TO A SMALL BREAK.

CONTROL ROOM INDICATIONS:

CALIBRATED JET PUMP FLOW

REACTOR LEVEL INDICATOR 263-106A

REACTOR LEVEL RECORDER 263-113

B -- SIMILAR TO MALF A.

REF: P&ID 29119, SH348
CWD 497

RR21 RPV N.R. YARWAY LEVEL TRANSMITTER FAILURE

VARIABLE (0-100% TRANSMITTER OUTPUT)

A - NR YARWAY A TRANSMITTER FAILURE

B - NR YARWAY B TRANSMITTER FAILURE

TYPE: GENERIC, VARIABLE (0-100% TRANSMITTER OUTPUT)

CAUSE: MECHANICAL FAILURE OF TRANSMITTER

PLANT STATUS: ANY

EFFECTS: A -- THE TRANSMITTER OUTPUT WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. IF INDICATED LEVEL EXCEEDS +48 INCHES THE LISTED ANNUNCIATORS WILL ACTUATE BUT NO OTHER EVENTS WILL OCCUR.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE TRANSMITTER.

CONTROL ROOM INDICATIONS:

REACTOR LEVEL INSTRUMENT 263-100A

ANNUNCIATORS:

RPV TURBINE TRIP A HI WATER LEVEL	CRP 905 A-2 (8-1)
HI RX WTR LVL FEED PUMP TRIP LOGIC ACTUATED	CRP 905 A-3 (4-1)

B -- SIMILAR TO MALF. A. IF BOTH ARE ACTIVATED SIMULTANEOUSLY THE TURBINE WILL TRIP, BUT THE REACTOR FEEDPUMPS WILL NOT.

REF: P&ID 29119,SH348
CWD ,664

RR22 RPV N.R. ROSEMONT LEVEL TRANSMITTER FAILURE

VARIABLE (0-100% TRANSMITTER OUTPUT)

A - NR ROSEMONT A TRANSMITTER FAILURE

B - NR ROSEMONT B TRANSMITTER FAILURE

C - NR ROSEMONT C TRANSMITTER FAILURE

D - NR ROSEMONT D TRANSMITTER FAILURE

TYPE: GENERIC, VARIABLE (0-100% TRANSMITTER OUTPUT)

CAUSE: MECHANICAL FAILURE OF TRANSMITTER

PLANT STATUS: ANY

EFFECTS: A -- THE TRANSMITTER OUTPUT WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. IF THE INDICATED LEVEL DECREASES BELOW -48" FOR MORE THAN 9 SECONDS ATWS CHANNEL "A" WILL TRIP BUT NO PROTECTIVE ACTION WILL OCCUR.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE TRANSMITTER.

CONTROL ROOM INDICATIONS:

ATWS PANEL LEVEL INDICATION

ANNUNCIATORS:

ATWS RPT TRIP DIVISION 1	CRP 905 A-3 (1-1)

(ANNUNCIATOR WILL ONLY COME IN IF MALFUNCTION "A" AND "C" ARE ENTERED TOGETHER TO CAUSE A DIVISION 1 TRIP.)

B-D SIMILAR TO MALF. A. EXCEPT B AND D CAUSE DIVISION 2 TRIP.

REF: P&ID 29119,SH348
CWD 428

RR23 RPV N.R. GEMAC LEVEL TRANSMITTER DRIFT

VARIABLE (0-100% = 0" - 60")

A - NR GEMAC A TRANSMITTER DRIFT

B - NR GEMAC B TRANSMITTER DRIFT

TYPE: GENERIC, VARIABLE (0-100% = (-60) - 60")

CAUSE: TRANSMITTER MISALIGNMENT

PLANT STATUS: ANY

EFFECTS: A -- THE INSTRUCTOR SPECIFIED VALUE WILL BE ADDED TO THE NORMAL TRANSMITTER OUTPUT. AT 0% OR 100% SEVERITY, THE INDICATED LEVEL WILL FAIL COMPLETELY DOWNSCALE OR UPSCALE, RESPECTIVELY. AT 50% SEVERITY NO DEVIATION FROM NORMAL WILL BE SEEN.

IF CHANNEL "A" IS SELECTED THE REACTOR WATER LEVEL CONTROL SYSTEM WILL ATTEMPT TO RESTORE LEVEL TO NORMAL, BUT IT WILL CONTROL AT AN ABNORMAL ACTUAL LEVEL EQUAL TO THE DRIFT.

IF RECORDED LEVEL INCREASES ABOVE 40 INCHES OR DECREASES BELOW 20 INCHES THE HI/LO ANNUNCIATOR WILL ACTUATE.

IF CHANNEL "B" IS SELECTED FOR LEVEL CONTROL, ONLY THE LEVEL INDICATION WILL BE AFFECTED.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE TRANSMITTER.

CONTROL ROOM INDICATION:

REACTOR LEVEL INDICATOR 640-29A

REACTOR LEVEL RECORDER 640-26

ANNUNCIATORS:

REACTOR HI/LO LEVEL	CRP 905 A-2 (2-1)

B -- SIMILAR TO MALF. A.

REF: P&ID 29119,SH348
CWD 661

RR24 RPV W.R. YARWAY LEVEL TRANSMITTER FAILURE

VARIABLE (0-100% TRANSMITTER OUTPUT)

A - WR YARWAY A TRANSMITTER FAILURE

B - WR YARWAY B TRANSMITTER FAILURE

TYPE: GENERIC, VARIABLE (0-100% TRANSMITTER OUTPUT)

CAUSE: MECHANICAL FAILURE OF TRANSMITTER

PLANT STATUS: ANY

EFFECTS: A -- THE TRANSMITTER OUTPUT SIGNAL WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. NO OTHER EFFECTS WILL BE OBSERVED UNLESS

ATTEMPTING TO INITIATE CONTAINMENT COOLING. IF INDICATED LEVEL IS LESS THAN 2/3 CORE HEIGHT CONTAINMENT COOLING WILL NOT BE PERMISSABLE IN THE A LOOP UNLESS THE CONTAINMENT SPRAY SECOND KEY IS IN THE MANUAL OVERRIDE POSITION.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE TRANSMITTER.

CONTROL ROOM INDICATIONS:

REACTOR LEVEL INDICATOR 263-106A

B -- SIMILAR TO MALF. A EXCEPT B AFFECTS THE B LOOP CONTAINMENT COOLING INTERLOCK.

REF: P&ID 29119,SH348
CWD 505,760

RR25 RPV W.R. ACCIDENT GEMAC LEVEL TRANSMITTER FAILURE

VARIABLE (0-100% TRANSMITTER OUTPUT)

- WR ACCIDENT GEMAC TRANSMITTER FAILURE

TYPE: VARIABLE (0-100% TRANSMITTER OUTPUT)

CAUSE: MECHANICAL FAILURE OF TRANSMITTER

PLANT STATUS: ANY

EFFECTS: THE OUTPUT SIGNAL FROM LT 112 WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. RECORDED LEVEL WILL RESPOND BUT NO OTHER EFFECTS WILL BE SEEN.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE TRANSMITTER.

CONTROL ROOM INDICATIONS:

REACTOR LEVEL RECORDER 263-113

REF: P&ID 29119,SH348
CWD 500

RR26 RPV W.R. FLOODUP GEMAC LEVEL TRANSMITTER FAILURE

VARIABLE (0-100% TRANSMITTER OUTPUT)

- WR FLOODUP GEMAC TRANSMITTER FAILURE

TYPE: VARIABLE (0-100% TRANSMITTER OUTPUT)

CAUSE: MECHANICAL FAILURE OF TRANSMITTER

PLANT STATUS: ANY

EFFECTS: THE OUTPUT SIGNAL FROM LT 61 WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. INDICATED LEVEL WILL RESPOND BUT NO OTHER EFFECT WILL BE SEEN.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE TRANSMITTER.

CONTROL ROOM INDICATIONS:

REACTOR LEVEL INDICATOR 263-101

REF: P&ID 29119,SH348
CWD 500

RW01 ROD WORTH MINIMIZER FAILS TO APPLY BLOCKS

- RWM FAILS TO BLOCK ROD MOTION

TYPE: SPECIFIC

CAUSE: RWM PROGRAM FAILS

PLANT STATUS: BELOW THE LOW POWER SET POINT

EFFECTS: WHEN A ROD MOVEMENT OUTSIDE THE LOADED SEQUENCE IS MADE, THE RWM WILL NOT INFORCE THE ROD BLOCKS (IN OR OUT) WHICH SHOULD BE APPLIED.

THE ROD WORTH MINIMIZER ROD BLOCK ANNUNCIATOR WILL ALARM AND THE OPERATOR DISPLAY WILL SHOW THE ERROR, BUT THE BLOCK WILL NOT BE APPLIED.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE RWM TO FUNCTION NORMALLY, AND WILL APPLY ANY BLOCK WHICH SHOULD BE ACTIVE.

ANNUNCIATORS:

RWM ROD BLOCK	CRP 905 A-1 (1-1)

REF: RWM TECH MANUAL

RW02 ROD WORTH MINIMIZER ROD WITHDRAWAL AND INSERT BLOCK

- RWM ROD WITHDRAWAL AND INSERT BLOCK

TYPE: SPECIFIC

CAUSE: RWM MALFUNCTION

PLANT STATUS: BELOW THE LOW POWER SET POINT

EFFECTS: THE ROD WORTH MINIMIZER WILL GENERATE A ROD WITHDRAWAL AND INSERT BLOCK. THE BLOCK WILL PREVENT ANY RODS FROM BEING MOVED. BYPASSING THE RWM FROM THE OPERATORS DISPLAY WILL ALLOW NORMAL ROD MOVEMENT.

REMOVAL OF THIS MALFUNCTION WILL ALLOW THE ROD MOTION TO RETURN TO NORMAL.

ANNUNCIATORS:

NONE

REF: RWM TECH MANUAL

RW03 ROD WORTH MINIMIZER CRITICAL SELF-TEST FAILURE

- RWM C[illegible]TICAL SELF-TEST FAILURE

TYPE: SPECIFIC

CAUSE: FEED FLOW/STEAM FLOW SIGNAL OUT OF SPEC

PLANT STATUS: ANY

EFFECTS: THE RWM WILL SEE POWER AS BOTH ABOVE AND BELOW THE LOW POWER SETPOINT, WHICH WILL CAUSE A CRITICAL SELF-TEST FAILURE. THIS WILL GENERATE A RWM BLOCK, PREVENTING NORMAL ROD MOVEMENT.

PRESSING MESSAGE ON THE RWM DISPLAY WILL DISPLAY "CRITICAL SELF-TEST FAILURE."

BYPASSING THE RWM WITH THE KEYLOCK SWITCH ON THE OPERATORS DISPLAY WILL REMOVE THE RWM BLOCK AND ALLOW NORMAL ROD MOVEMENT.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE POWER LEVEL SETPOINT INFORMATION TO NORMAL, AND AFTER ONE SELF-TEST CYCLE, THE RWM BLOCK WILL BE REMOVED.

ANNUNCIATOR:

RWM ROD BLOCK	905 A1(1-1)

REF: RWM TECH MANUAL

SC01 TBSCCW PUMP TRIP

A - TBSCCW PUMP A TRIP

B - TBSCCW PUMP B TRIP

TYPE: GENERIC

CAUSE: ACTUATION OF OVERLOAD TRIP RELAY

PLANT STATUS: 100%

EFFECTS: A -- TBSCCW PUMP A WILL TRIP CAUSING THE TBSCCW SYSTEM FLOW AND PRESSURE TO DECREASE. FLOW WILL BE LOST TO THE FOLLOWING COMPONENTS:

- STATION AIR COMPRESSOR
- INSTRUMENT AIR COMPRESSOR
- CONDS PUMP MOTORS THRUST BEARINGS
- CONDS PUMP SPACE COOLERS
- CONDS BSTR PUMPS BEARING OIL COOLERS
- REACTOR FEED PUMPS OIL COOLERS
- SHUTDOWN COOLING PUMPS SPACE COOLER
- CORE SPRAY PUMPS SPACE COOLER
- CRD PUMPS SPACE COOLERS
- CRD PUMPS
- RWCU PUMPS SPACE COOLERS
- RECIRC MG SETS SPACE COOLERS
- RBCCW PUMPS SPACE COOLERS
- DIESEL GEN SPACE COOLERS
- REACTOR FEED PUMPS SPACE COOLERS
- STEAM TUNNEL SPACE COOLERS
- A/C UNITS HVAC-1 & HVAC-2

DEPENDING ON THE PLANT STATUS AND THE EQUIPMENT IN OPERATION, THE ASSOCIATED TEMPERATURES OF THE ABOVE COMPONENTS WILL INCREASE.

SC01

ANNUNCIATORS:

SECONDARY COOLING WTR PMP A OR B TRIP	CRP 906 A2-2 (9-5)
SECONDARY COOLING WTR PUUMPS DISCHARGE PRESS LOW	CRP 906 A2-2 (9-6)

IF TBSCCW PUMP B IS IMMEDIATELY STARTED, TBSCCW PRESSURE AND FLOW WILL RETURN TO NOMAL AND THE TEMPERATURES OF THE ABOVE COMPONENTS WILL NOT BE AFFECTED.

IF TBSCCW SYSTEM PRESSURE AND FLOW ARE NOT RETURNED TO NORMAL, THE MAJOR EFFECTS WILL BE:

- STATION AND INSTRUMENT AIR COMPRESSORS TRIP DUE TO HIGH TEMPERATURE

- HIGH TEMPERATURE ON THOSE COMPONENTS SUPPLIED WITH SPACE COOLER AND/OR LUBE OIL COOLERS WHICH RECEIVE COOLING FROM TBSCCW

B -- SIMILAR TO MALF A EXCEPT TBSCCW PUMP B IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RETURN THE PUMP TO NORMAL.

REF: P&ID 26011
CWD'S SH 155 & 156

SC02 TBSCCW HX TUBE LEAK

VARIABLE (100% = 500 GPM)

A - TBSCCW HX A TUBE LEAK

B - TBSCCW HX B TUBE LEAK

TYPE: GENERIC, VARIABLE (100% = 500 GPM)

CAUSE: TUBE FAILURE

PLANT STATUS: 100% POWER

EFFECTS: A -- THIS MALFUNCTION WILL NORMALLY RESULT IN LEAKAGE OUT OF THE TBSCCW SYSTEM AND INTO THE SERVICE WATER SYSTEM.

IF THE TBSCCW SYSTEM IS SHUTDOWN AND THE SERVICE WATER SYSTEM IS IN OPERATION, THE LEAKAGE WILL BE INTO THE TBSCCW SYSTEM.

ANY LEAKAGE INTO THE TBSCCW SYSTEM WILL CAUSE THE TBSCCW SURGE TANK TO FILL UP AND OVERFLOW TO RX BLDG FLOOR DRAIN SUMP B.

IF THE LEAKAGE OUT OF THE TBSCCW SYSTEM IS EQUAL TO OR LESS THAN THE SURGE TANK MAKEUP FLOW RATE, THE TBSCCW SYSTEM INVENTORY WILL BE MAINTAINED IF THE SURGE TANK MAKEUP VALVE IS OPENED USING REMOTE FUNCTION SCR04.

IF THE TBSCCW SYSTEM INVENTORY CANNOT BE MAINTAINED, THE SURGE TANK LEVEL WILL DECREASE. THE RATE OF DECREASE WILL DEPEND UPON THE MALFUNCTION SEVERITY.

WHEN THE PUMP SUCTION PRESSURE DECREASES BELOW THE REQUIRED NPSH, THE TBSCCW PUMPS WILL START TO CAVITATE. ADDITIONAL LOSS OF INVENTORY WILL RESULT IN A LOSS OF SYSTEM FLOW. THE EFFECTS OF LOSS OF SYSTEM FLOW ARE DESCRIBED IN MALFUNCTION SC01 EFFECTS.

IF THE AFFECTED HEAT EXCHANGER IS ISOLATED USING REMOTE FUNCTION SCR01, THE LEAKAGE WILL BE STOPPED.

ANNUNCIATORS:

SECONDARY COOLING WTR PUMPS DISCHARGE PRESS LOW — CRP 906 A2-2 (9-6)

SECONDARY COOLING WTR SURGE TANK LEVEL HIGH — CRP 906 A1-2 (7-7)

SC02

SECONDARY COOLING WTR SURGE TANK LEVEL LOW

CRP 906 A1-2 (8-7)

B -- SIMILAR TO MALF A EXCEPT TBSCCW HX B IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL REPAIR THE LEAKING TUBES.

REF: P&ID 26011

SC03 LOSS OF TBSCCW TO CONDS PP MOTOR BRNG)OLER

VARIABLE (100% = COMPLETE LOSS OF FLOW)

A - FAILURE OF TBSCCW TO CONDENSATE PUMP A

B - FAILURE OF TBSCCW TO CONDENSATE PUMP B

C - FAILURE OF TBSCCW TO CONDENSATE PUMP C

TYPE: GENERIC, VARIABLE (100% = COMPLETE LOSS OF FLOW)

CAUSE: FLOW BLOCKAGE AT THE INLET OF THE COOLER

PLANT STATUS: 100% POWER

EFFECTS: A -- THIS MALFUNCTION WILL DECREASE THE COOLING WATER FLOW THRU THE BEARING COOLER. WHEN THE FLOW DECREASES TO 2 GPM, THE LOW FLOW ALARM WILL ACTUATE. THE DECREASE IN COOLING WATER FLOW WILL CAUSE THE PUMP BEARING TEMPERATURES TO INCREASE. THE BEARING TEMPERATURES ARE INDICATED ON THE RECORDER ON CRP 931. THE INCREASE IN THRUST BEARING TEMPERATURE WILL CAUSE INCREASED RESISTANCE, WHICH IN TURN WILL CAUSE AN INCREASE IN PUMP CURRENT. THE CONDENSATE PUMP WILL EVENTUALLY TRIP DUE TO OVERCURRENT.

CONTROL PANEL INDICATIONS:

CONDENSATE PUMP CURRENT

CONDENSATE PUMP BEARING TEMPERATURES

ANNUNCIATORS:

COND PUMPS BEARING COOLING WATER FLOW LOW	CRP 906 A1-2 (1-6)
COND PUMP A OVERLOAD OR TRIP	CRP 906 A1-1 (1-1)
COND PUMP A,B OR C TRIP	CRP 906 A1-1 (1-4)

B -- SIMILAR TO MALFUNCTION A EXCEPT CONDENSATE PUMP B IS THE AFFECTED COMPONENT.

C -- SIMILAR TO MALFUNCTION A EXCEPT CONDENSATE PUMP C IS THE AFFECTED COMPONENT.

SC03

MALFUNCTION REMOVAL WILL RESTORE COOLING WATER FLOW TO THE THRUST BEARING COOLERS. IT WILL NOT RESTORE THE DAMAGED BEARINGS.

REF: P&ID 26011

SC04 LOSS OF TBSCCW TO CONDS BSTR PP BEARING COOLER

VARIABLE (100% = COMPLETE LOSS OF FLOW)

A - FAILURE OF TBSCCW TO COND BOOSTER PUMP A

B - FAILURE OF TBSCCW TO COND BOOSTER PUMP A

C - FAILURE OF TBSCCW TO COND BOOSTER PUMP B

TYPE: GENERIC, VARIABLE (100% = COMPLETE LOSS OF FLOW)

CAUSE: FLOW BLOCKAGE AT THE INLET OF THE COOLER

PLANT STATUS: 100% POWER

EFFECTS: A -- THIS MALFUNCTION WILL DECREASE THE COOLING WATER FLOW THRU THE BEARING COOLER. WHEN THE FLOW DECREASES TO 1 GPM, THE LOW FLOW ALARM WILL ACTUATE. THE DECREASE IN COOLING WATER FLOW WILL CAUSE THE BOOSTER PUMP BEARING TEMPERATURES TO INCREASE. THE HIGH BEARING TEMPERATURE ALARM WILL ACTUATE AT 155 DEG F. THE INCREASE IN BEARING TEMPERATURES WILL CAUSE INCREASED RESISTANCE, WHICH IN TURN WILL CAUSE AN INCREASE IN PUMP CURRENT. THE CONDENSATE BOOSTER PUMP WILL EVENTUALLY TRIP DUE TO OVERCURRENT.

CONTROL PANEL INDICATIONS:

CONDENSATE BOOSTER PUMP BEARING TEMPERATURES

CONDENSATE BOOSTER PUMP CURRENT

ANNUNCIATORS:

COND BOOSTER PUMPS BEARING TEMPERATURE HIGH	CRP 906 A1-2 (2-7)
COND BOOSTER PUMPS BEARING COOLING WATER FLOW LOW	CRP 906 A1-2 (2-6)
COND BOOSTER PUMP A OVERLOAD OR FAULT TRIP	CRP 906 A1-1 (2-1)
COND BOOSTER PUMP A,B OR C TRIP	CRP 906 A1-1 (2-4)

B -- SIMILAR TO MALFUNCTION A EXCEPT CONDENSATE BOOSTER PUMP B IS THE AFFECTED COMPONENT.

SC04

C -- SIMILAR TO MALFUNCTION A EXCEPT CONDENSATE BOOSTER PUMP C IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL RESTORE COOLING WATER FLOW TO THE BEARING COOLER. IT WILL NOT RESTORE THE DAMAGED BEARINGS.

REF: P&ID 26011

SC05 LOSS OF TBSCCW TO REACTOR FEED PUMP LUBE OIL COOLER

VARIABLE (100% = COMPLETE LOSS OF FLOW)

A - FAILURE OF TBSCCW TO RX FEED PUMP A

B - FAILURE OF TBSCCW TO RX FEED PUMP B

C - FAILURE OF TBSCCW TO RX FEED PUMP C

TYPE: GENERIC, VARIABLE (100% = COMPLETE LOSS OF FLOW)

CAUSE: LOW BLOCKAGE AT THE INLET OF THE COOLER

PLANT STATUS: 100%

EFFECTS: A -- THIS MALFUNCTION WILL DECREASE THE COOLING WATER FLOW THRU THE LUBE OIL COOLER. WHEN THE FLOW DECREASES TO 20 GPM, THE LOW FLOW ALARM WILL ACTUATE. THE DECREASE IN COOLING WATER WILL CAUSE THE REACTOR FEED PUMP BEARING TEMPERATURES TO INCREASE. THE HIGH BEARING TEMPERATURE ALARMS WILL ACTUATE AS FOLLOWS: GROUP ONE-190F, GROUP TWO-160 DEG F, AND GROUP THREE-155 DEG F. THE INCREASE IN BEARING TEMPERATURES WILL CAUSE INCREASED RESISTANCE, WHICH IN TURN WILL CAUSE AN INCREASE IN PUMP CURRENT. THE REACTOR FEED PUMP WILL EVENTUALLY TRIP DUE TO OVERCURRENT.

CONTROL PANEL INDICATIONS:

REACTOR FEED PUMP BEARING TEMPERATURES

REACTOR FEED PUMP CURRENT

ANNUNCIATORS:

REACTOR FEED PMP GP-1 BEARING TEMPERATURE HIGH	CRP 906 A1-1 (6-1)
REACTOR FEED PMP GP-2 BEARING TEMPERATURE HIGH	CRP 906 A1-1 (6-2)
REACTOR FEED PMP GP-3 BEARING TEMPERATURE HIGH	CRP 906 A1-1 (6-3)
REACTOR FEED PMP OIL COOLER COOLING WATER FLOW LOW	CRP 906 A1-1 (9-2)
REACTOR FEED PMP A OVERLOAD OR FAULT TRIP	CRP 906 A1-1 (3-1)

SC05

B -- SIMILAR TO MALFUNCTION A EXCEPT REACTOR FEED PUMP B IS THE AFFECTED COMPONENT.

C -- SIMILAR TO MALFUNCTION A EXCEPT REACTOR FEED PUMP C IS THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL RESTORE COOLING WATER FLOW TO THE LUBE OIL COOLER. IT WILL NOT RESTORE THE DAMAGED BEARINGS.

REF: P&ID 26011

SC06 TBSCCW HEADER LEAK

VARIABLE (50% = SURGE TANK MAKEUP FLOW RATE)

- TBSCCW HEADER LEAK AT HX OUTLET

TYPE: SPECIFIC, VARIABLE (50% = SURGE TANK MAKEUP FLOW RATE)

CAUSE: PIPE FAILURE AT THE DISCHARGE OF THE TBSCCW HEAT EXCHANGERS

PLANT STATUS: 100% POWER

EFFECTS: THIS MALFUNCTION WILL RESULT IN LEAKAGE OF TBSCCW SYSTEM WATER INTO THE TURBINE BUILDING. THE WATER WILL COLLECT IN TURBINE BUILDING AIR COMPRESSOR SUMP. WHEN THE SUMP LEVEL REACHES IT'S HIGH LEVEL SETPOINT THE SUMP PUMP WILL START. IF THE SUMP LEVEL REACHES THE HIGH-HIGH LEVEL SETPOINT A HIGH-HIGH LEVEL ALARM WILL ACTUATE.

THE EFFECTS OF LEAKAGE OUT OF THE TBSCCW SYSTEM ARE DESCRIBED IN MALFUNCTION SC02 EFFECTS.

ANNUNCIATORS:

TURBINE BUILDING AREA DRAIN SUMP HIGH LEVEL	CRP 907 A1-1 (9-3)

MALFUNCTION REMOVAL WILL STOP THE LEAK.

REF: P&ID 26011
P&ID 29138 SH 1
CWD 917

SC08 LOSS OF TBSCCW PUMP BREAKER CONTROL POWER

A - TBSCCW PUMP A LOSS OF CONTROL POWER

B - TBSCCW PUMP B LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES IN CONTROL CIRCUIT

PLANT STATUS: 100% POWER

EFFECTS: WHEN THIS MALFUNCTION IS INSERTED, BOTH FUSES ON THE POSITIVE SIDE OF THE CONTROL CIRCUIT WILL BLOW.

A -- WITH THE FUSES BLOWN, THE PUMP STOP/RUN INDICATION WILL EXTINGUISH AND THE PUMP CANNOT BE STARTED IF STOPPED OR CANNOT BE SHUT OFF IF RUNNING. THE PUMP WILL TRIP IF MALFUNCTION SC01 IS INSERTED. IF THE PUMP WAS RUNNING BEFORE A LNP IT WILL RESTART AS SOON AS POWER IS RETURNED. IF IT WAS NOT RUNNING BEFORE AN LNP IT WILL NOT AUTO START WHEN POWER IS RETURNED.

ANNUNCIATORS:

NONE

B -- SIMILAR TO MALFUNCTION A EXCEPT PUMP B IS THE AFFECTED COMPONENT. ALSO, IF PUMP B WAS RUNNING BEFORE A LNP IT'S BREAKER WILL NOT TRIP AND THE PUMP WILL RESTART AS SOON AS POWER IS AVAILABLE. IF IT WAS NOT RUNNING BEFORE A LNP AND PUMP A BREAKER IS NOT CLOSED WHEN POWER IS RETURNED, PUMP B WILL NOT AUTO START 15 SECONDS AFTER POWER IS RETURNED.

MALFUNCTION REMOVAL WILL REPLACE THE BLOWN FUSES.

REF: CWD'S 155,156,136,310

SDC1 SHUTDOWN COOLING PUMP TRIP

A - SHUTDOWN COOLING PUMP A TRIP

B - SHUTDOWN COOLING PUMP B TRIP

TYPE: GENERIC

CAUSE: MOTOR SHORT CIRCUIT

PLANT STATUS: SHUTDOWN

EFFECTS: A -- IF THE PUMP IS RUNNING, OR WHEN STARTED, THE THERMAL OVERLOAD DEVICE WILL TRIP AND THE PUMP WILL STOP. THE PUMP TRIPPED ANNUNCIATOR WILL ACTUATE. FLOW IN THE SHUTDOWN COOLING SYSTEM WILL COAST DOWN AND THE LOAD ON THE HEAT EXCHANGER WILL DECREASE TO ZERO.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESET THE BREAKER AND ALLOW THE PUMP TO OPERATE NORMALLY.

CONTROL ROOM INDICATION:

PUMP DISCHARGE PRESSURE

HEAT EXCHANGER TEMPERATURES

ANNUNCIATORS:

SHUTDOWN COOLING PUMP A TRIPPED BY OVERLOAD	CRP 904 A1-1 (8-3)

B -- SIMILAR TO MALF. A

REF: P&ID 29128
CWD 855
OP 305

SD02 SHUTDOWN COOLING PUMP DISCHARGE VALVE FAILURE

VARIABLE (0-100% VALVE POSITION)

A - S/D COOL PP A DISCHG VALVE FAILURE

B - S/D COOL PP B DISCHG VALVE FAILURE

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: VALVE MOTOR ELECTRICAL FAILURE

PLANT STATUS: SHUTDOWN

EFFECTS: A -- WHEN THE VALVE OPERATES THROUGH THE INSTRUCTOR SPECIFIED POSITION THE MOTOR WILL STOP OPERATING. VALVE POSITION INDICATION WILL STILL BE AVAILABLE. THE VALVE INDICATING LIGHTS WILL GO OFF. THE VALVE WILL REMAIN AT ITS PRESENT POSITION.

REMOVAL OF THIS MALFUNCTION AND USE OF OVERCURRENT RESET EDR17 WILL RESET THE OVERCURRENT DEVICE AND CLOSE THE BREAKER.

CONTROL ROOM INDICATION:

VALVE POSITION

PUMP DISCHARGE PRESSURE

HEAT EXCHANGER TEMPERATURES

B -- SIMILAR TO MALF. A.

REF: P&ID 29128
CWD 859
OP 305

SD03 SHUTDOWN COOLING PUMP SUCTION VALVE FAILS CLOSED

A - S/D COOL PP A SUCT VALVE FAILS CLOSED

B - S/D COOL PP B SUCT VALVE FAILS CLOSED

TYPE: GENERIC

CAUSE: CONTROL SWITCH CONTACTS 3-3T WELDED.

PLANT STATUS: SHUTDOWN

EFFECTS: A -- THE VALVE WILL CLOSE FULLY IF AN OPEN SIGNAL IS NOT PRESENT. ONCE FULLY CLOSED, AN OPEN SIGNAL WILL CAUSE THE VALVE TO OPEN, BUT WHEN THE SIGNAL CLEARS OR THE VALVE IS FULLY OPEN IT WILL CLOSE AGAIN. THE OPEN SIGNAL WILL HAVE NO EFFECT UNTIL THE VALVE IS FULLY CLOSED.

IF THE SHUTDOWN COOLING PUMP IS RUNNING, IT WILL TRIP ON LOW SUCTION PRESSURE AS THE VALVE CLOSES. THE POINT AT WHICH THIS OCCURS WILL VARY DEPENDING ON PUMP FLOW. AT HIGHER FLOWS IT WILL TRIP WITH THE VALVE FURTHER OPEN.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE CONTROL SWITCH.

CONTROL ROOM INDICATIONS:

VALVE POSITION LIGHTS

PUMP DISCHARGE PRESSURE

PUMP BREAKER STATUS

B -- SIMILAR TO MALF. A

REF: P&ID 29128
CWD 858
OP 305

SD04 SHUTDOWN COOLING SYSTEM INLET VALVE 1-SD-1 BINDS

VARIABLE (0-100% VALVE POSITION

- S/D COOLING INLET 1-SD-1 BINDS

TYPE: VARIABLE (0-100% VALVE POSITION

CAUSE: VALVE OPERATOR BINDS

PLANT STATUS: SHUTDOWN

EFFECTS: WHEN THE VALVE OPERATES THROUGH THE INSTRUCTOR SPECIFIED POSITION THE VALVE MOTOR SUPPLY BREAKER WILL TRIP. THE VALVE INDICATING LIGHTS WILL GO OUT AND THE VALVE WILL REMAIN AT ITS PRESENT POSITION.

WHILE THIS MALFUNCTION IS ACTIVE AND AFTER THE VALVE HAS TRIPPED, REMOTE FUNCTION SDR01 CAN BE USED TO OPEN OR CLOSE THE VALVE BY MEANS OF THE VALVE HANDWHEEL.

REMOVAL OF MALFUNCTION AND RESET OF OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RECLOSE THE BREAKER. THE VALVE WILL REMAIN AT ITS PRESENT POSITION UNTIL AN OPEN OR CLOSE SIGNAL IS RECEIVED.

CONTROL ROOM INDICATIONS:

VALVE STATUS LIGHTS

REF: P&ID 29128
CWD 863
OP 305

SD05 SHUTDOWN COOLING HX TUBE LEAK

VARIABLE (100% = 500 GPM)

A - S/D COOLING HX A TUBE LEAK

B - [illegible]OOLING HX B TUBE LEAK

TYPE: GENERI[illegible] VA[illegible]ABLE (100% = 500 GPM)

CAUSE: TUBE ERO[illegible]ON

PLANT STATUS: SHUTDOWN

EFFECTS: A -- WITH THE SHUTDOWN COOLING SYSTEM IN OPERATION, LEAKAGE WILL OCCUR INTO THE RBCCW SYSTEM. REACTOR WATER LEVEL WILL DECREASE WHILE RBCCW SURGE TANK LEVEL INCREASES AND OVERFLOWS. RBCCW PROCESS RADIATION WILL INCREASE.

WITH THE SHUTDOWN COOLING SYSTEM LINED UP BUT NOT IN OPERATION, LEAKAGE WILL OCCUR FROM THE RBCCW SYSTEM INTO THE SHUTDOWN COOLING SYSTEM. REACTOR LEVEL WILL INCREASE AND RBCCW SURGE TANK LEVEL WILL DECREASE UNTIL THE RBCCW PUMPS CAVITATE.

CLOSING THE PUMP SUCTION VALVE AND HEAT EXCHANGER OUTLET VALVE WILL ISOLATE THE LEAK.

REMOVAL OF THIS MALFUNCTION WILL STOP THE LEAKAGE.

CONTROL ROOM INDICATIONS:

RBCCW ACTIVITY

HEAT EXCHANGER TEMPERATURES

REACTOR WATER LEVEL

ANNUNCIATORS:

REACTOR BUILDING COOLING WATER SURGE TANK LEVEL HIGH	CRP 906 A2-1 (9-3)
REACTOR BUILDING COOLING WATER SURGE TANK LEVEL LOW	C[illegible] 906 A2-1 ([illegible])
LIQUID PROCESS HI RADIATION	CRP 904 A-1 (8-1)

B -- SIMILAR TO MALF. A.

SD05

REF: P&ID 29128
CWD 829
OP 305

SD06 LOSS OF SHUTDOWN COOLING PUMP BREAKER CONTROL POWER

A - S/D COOLING PUMP A LOSS OF CONTROL PWR

B - S/D COOLING PUMP B LOSS OF CONTROL PWR

TYPE: GENERIC

CAUSE: BLOWN FUSES IN THE CONTROL POWER SUPPLY

PLANT STATUS: SHUTDOWN

EFFECTS: A -- THE PUMP STATUS LIGHTS WILL GO OUT. IF STOPPED, THE PUMP WILL NOT START. IF RUNNING, THE PUMP WILL NOT TRIP AS THE RESULT OF EITHER MANUAL OR AUTOMATIC SIGNALS, BUT IT WILL TRIP IF MALFUNCTION SD01 IS ACTIVATED.

REMOVAL OF THIS MALFUNCTION WILL RESTORE CONTROL POWER AND ALLOW NORMAL PUMP OPERATION.

CONTROL ROOM INDICATIONS:

PUMP STATUS LIGHTS

HEAT EXCHANGER TEMPERATURES

B -- SIMILAR TO MALF. A.

REF: P&ID 29128
CWD 855
OP 305

SD07 ISOLATION CONDENSER RETURN VALVE 1-IC-3 FAILURE

VARIABLE (0-100% INDICATED VALVE POSITION)

- ISO CONDENSER RETURN 1-IC-3 BINDS

TYPE: VARIABLE (0-100% INDICATED VALVE POSITION)

CAUSE: BINDING OF THE VALVE OPERATOR

PLANT STATUS: ANY

EFFECTS: WHEN OPERATED THROUGH THE INSTRUCTOR SPECIFIED POSITION THE VALVE MOTOR THERMAL OVERLOAD DEVICE 49 WILL TRIP. THE INDICATING LIGHTS WILL GO OUT, BUT THE VALVE WILL NOT RESPOND TO ANY CONTROL SIGNALS.

THE VALVE CAN BE MANUALLY POSITIONED BY USING REMOTE FUNCTIONS SDR05 TO DISENGAGE THE MOTOR OPERATOR AND THEN USING SDR06 TO POSITION THE VALVE. (NOTE: THE FULL OPEN LIGHT INDICATION CORRESPONDS TO ABOUT 20% ACTUAL VALVE POSITION WHICH CORRESPONDS TO 100% MALFUNCTION SEVERITY.)

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESTORE NORMAL VALVE OPERATION.

CONTROL ROOM INDICATIONS:

VALVE INDICATING LIGHTS

ISOLATION CONDENSER HEAT REMOVAL RATE

REF: P&ID 29131
CWD 882
OP 307

SD08 ISOLATION CONDENSER TUBE LEAKAGE

VARIABLE (100% = 1 X 10E6 LBM/HR)

- ISO CONDENSER TUBE LEAKAGE

TYPE: VARIABLE (100% = 1 X 10E6 LBM/HR)

CAUSE: TUBE FAILURE

PLANT STATUS: 100% POWER

EFFECTS: STEAM FROM THE REACTOR WILL FLOW INTO THE ISOLATION CONDENSER SHELL. THE HIGH STEAM FLOW WILL ACTUATE THE STEAM LINE BREAK ANNUNCIATOR AND INITIATE A GROUP 4 ISOLATION. THE ISOLATION CONDENSER INLET AND OUTLET VALVES WILL CLOSE STOPPING THE STEAM FLOW.

IF THIS MALFUNCTION IS ACTUATED AT LOW REACTOR PRESSURE OR AT A SMALL SEVERITY, THE ISOLATION WILL NOT OCCUR. STEAM WILL CONTINUE TO LEAK INTO THE SHELL SIDE RAISING THE WATER TEMPERATURE. WHEN SHELL SIDE TEMPERATURE EXCEEDS 212 DEGREES, BOILING WILL OCCUR.

IF THIS MALFUNCTION IS ACTIVATED WHILE THE ISOLATION CONDENSER IS IN OPERATION, THE STEAM LEAKAGE FLOW WILL BE IN ADDITION TO THE NORMAL FLOW DUE TO CONDENSATION. IF REACTOR IS DEPRESSURIZED, OR ONLY SLIGHTLY ABOVE ATMOSPHERIC PRESSURE, THIS MALFUNCTION WILL ALLOW WATER FROM THE ISOLATION CONDENSER SHELL TO FLOW INTO THE RECIRCULATION SYSTEM.

CONTROL ROOM INDICATIONS:

ISOLATION CONDENSER TEMPERATURES

GROUP 4 ISOLATION

ANNUNCIATORS:

ISOLATION COND STM LINE BREAK	CRP 903 A2 (9-3)
ISOLATON CONDENSER HI TEMPERATURE	CRP 903 A2 (7-3)

REF: P&ID 29131
CWD 612
OP 307

SD09 ISOLATION CNDSR SHELL MAKEUP VALVE 1-IC-10 FAILURE

VARIABLE (0-100% VALVE POSITION)

- ISO CONDENSER MAKEUP 1-IC-10 FAILS

TYPE: VARIABLE (0-100% VALVE POSITION)

CAUSE: BINDING OF THE VALVE OPERATOR

PLANT STATUS: ISOLATION CONDENSER IN OPERATION

EFFECTS: WHEN THE VALVE IS OPERATED THROUGH THE INSTRUCTOR SPECIFIED POSITION THE THERMAL OVERLOAD DEVICE 49 WILL TRIP. THE VALVE WILL REMAIN AT ITS PRESENT POSITION AND THE INDICATING LIGHT WILL GO OUT.

IF THE VALVE IS OPEN AND THE MAKEUP RATE TO THE ISOLATION CONDENSER SHELL IS GREATER THAN THE EVAPORATION RATE, LEVEL WILL INCREASE. IF LEVEL INCREASES TO THE LEVEL OF THE VENT, NO FURTHER EFFECTS WILL BE SEEN DUE TO WATER LEVEL. THE EFFECTS OF THE FIRE WATER TEMPERATURE WILL STILL BE SEEN.

IF THE MAKEUP RATE IS LESS THAN THE EVAPORATION RATE, THE SHELL LEVEL WILL BOIL DOWN. AS THE TUBES ARE UNCOVERED, THE HEAT EXCHANGE RATE WILL DECREASE. REACTOR PRESSURE WILL RESPOND ACCORDINGLY.

REMOVAL OF MALFUNCTION AND RESET OF OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17, WILL RESTORE NORMAL OPERATION OF THE VALVE. IT WILL REMAIN AT ITS PRESENT POSITION UNTIL AN OPEN OR CLOSE SIGNAL IS RECEIVED.

CONTROL ROOM INDICATIONS:

VALVE INDICATING LIGHTS

ISOLATION CONDENSER TEMPERATURES

ANNUNCIATORS:

ISOLATION CONDENSER HI-HI/LO LEVEL	CRP 903 A2 (6-3)

REF: P&ID 29131
CWD 884
OP 307

SL01 LOSS OF SLC SQUIB VALVE CONTINUITY

A - SLC SQUIB VALVE A LOSS OF CONTINUITY

B - SLC SQUIB VALVE B LOSS OF CONTINUITY

TYPE: GENERIC

CAUSE: LOOSE WIRE IN CONTINUITY MONITOR CIRCUIT

PLANT STATUS: 100%

EFFECTS: A -- POWER WILL BE LOST TO BOTH SQUIB PRIMERS IN VALVE 1-SL-5A PREVENTING IT FROM FUNCTIONING. THE CONTINUITY INDICATING LIGHT WILL GO OUT AND THE LOSS OF POWER ANNUNCIATOR WILL ACTUATE.

IF THE STANDBY LIQUID CONTROL SWITCH IS PLACED IN THE SYSTEM 1 POSITION, THE PUMP WILL START BUT THE SQUIB VALVE WILL NOT OPEN. PUMP DISCHARGE PRESSURE WILL RISE TO ABOUT 1500 PSIG. THE RELIEF VALVE WILL OPEN ALLOWING THE PUMP DISCHARGE TO RETURN TO THE TANK. NO TRANSIENT WILL BE OBSERVABLE ON THE TANK LEVEL INDICATOR. THE RWCU SYSTEM WILL ISOLATE, BUT NO BORON SOLUTION WILL REACH THE REACTOR VESSEL.

REMOVAL OF THE MALFUNCTION WILL RESTORE CONTINUITY.

IF THE SWITCH IS STILL IN THE SYSTEM 1 POSITION, THE VALVE WILL OPEN. THE CONTINUITY LIGHT MAY FLICKER ON, AND THEN IMMEDIATELY OFF AS THE SQUIBS FIRE. PUMP DISCHARGE PRESSURE WILL DECREASE TO ABOUT 75 PSI ABOVE REACTOR PRESSURE. TANK LEVEL WILL BEGIN TO DECREASE AS BORON SOLUTION IS PUMPED INTO THE REACTOR.

B -- SIMILAR TO MALF A.

CONTROL ROOM INDICATIONS:

STANDBY LIQUID CONTROL SYSTEM PRESSURE

STANDBY LIQUID CONTROL TANK LEVEL

SQUIB CONTINUITY CURRENT

ANNUNCIATORS:

SQUIB VALVE OPEN/LOSS OF POWER	CRP 905 A-1 (9-3)

SL01

REF:	P&ID	29119, SH 4
	CWD	665,614
	OP	304

SL02 SLC LIQUID TANK LEAK

VARIABLE (100% = 500 GPM)

- SLC TANK LEAK

TYPE: VARIABLE (100% = 500 GPM)

CAUSE: HOLE IN BOTTOM OF SLC TANK

PLANT STATUS: ANY

EFFECTS: BORON SOLUTION WILL DRAIN FROM THE SLC TANK TO THE 55 GALLON DRUM AND THEN OVERFLOW TO THE REACTOR BUILDING FLOOR DRAIN SUMP A. TANK LEVEL WILL DECREASE TO ZERO. THE LOW LEVEL ANNUNCIATOR WILL ACTUATE AS LEVEL DECREASES BELOW 68.5%. WHEN LEVEL DESCREASES BELOW 25%, THE HEATER WILL DE-ENERGIZE. THE TANK TEMPERATURE WILL DECREASE TO AMBIENT MORE RAPIDLY SINCE THE DETECTOR IS UNCOVERED. THE LOW TEMPERATURE ANNUNCIATOR WILL ACTUATE IF TEMPERATURE DECREASES BELOW 90 DEG F.

IF THE PUMPS ARE RUN WITH NO SOLUTION IN THE TANK, OR ARE RUNNING WHEN LEVEL REACHES ZERO, DISCHARGE PRESSURE WILL DECREASE AS IF THE PUMP HAD BEEN STOPPED, DROPPING QUICKLY TO REACTOR PRESSURE AND THEN DECAYING ATMOSPHERIC PRESSURE, OR DROPPING QUICKLY TO ATMOSPHERIC IF THE RECIRC TEST LINE IS OPEN.

REMOVAL OF THE MALFUNCTION WILL STOP THE LEAKAGE. IF DESIRED, THE TANK MAY BE REFILLED USING REMOTE FUNCTION SLR04.

CONTROL ROOM INDICATIONS:

STANDBY LIQUID CONTROL TANK LEVEL

ANNUNCIATORS:

STBY LIQUID CONT TANK HI/LO LEVEL	CRP 905 A-1 (8-3)
STBY LIQUID CONT TANK HI/LO TEMPERATURE	CRP 905 A-1 (7-3)

REF: P&ID 29129, SH 4
CWD 668
OP 304

SL03 SLC PUMP TRIP

A - SLC PUMP A TRIP

B - SLC PUMP B TRIP

TYPE: GENERIC

CAUSE: MOTOR SHORT CIRCUIT

PLANT STATUS: ANY

EFFECTS: A -- IF RUNNING, OR WHEN STARTED, THE SLC PUMP OVERLOAD DEVICE 49 WILL TRIP CAUSING THE PUMP TO STOP AND THE INDICATING LIGHT TO GO OUT. THE SQUIB VALVE WILL STILL FUNCTION NORMALLY.

REMOVAL OF MALFUNCTION AND RESET OF OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17, WILL RECLOSE THE BREAKER AND ALLOW NORMAL OPERATION OF THE PUMP.

CONTROL ROOM INDICATIONS:

PUMP STATUS LIGHT

ANNUNCIATORS:

NONE

B -- SIMILAR TO MALF A.

REF: P&ID 29129
CWD 666,668
OP 304

SW01 SERVICE WATER PUMP TRIP

A - SERVICE WATER PUMP A TRIP

B - SERVICE WATER PUMP B TRIP

C - SERVICE WATER PUMP C TRIP

D - SERVICE WATER PUMP D TRIP

TYPE: GENERIC

CAUSE: OVERLOAD TRIP

PLANT STATUS: 100% POWER

EFFECTS: A -- THE SERVICE WATER PUMP MOTOR WILL SHORT, CAUSING THE PUMP CURRENT TO SPIKE AND THE BREAKER TO TRIP DUE TO INSTANTANEOUS OVERCURRENT. THE PUMP TRIP WILL CAUSE SERVICE WATER FLOW AND PRESSURE TO DECREASE. THE DECREASE IN PRESSURE (COMPUTER POINT F219) WILL BE IN ACCORDANCE WITH THE FLOW CHARACTERISTIC OF THE REMAINING SERVICE WATER PUMP(S). SERVICE WATER FLOW WILL BE REDUCED TO THE FOLLOWING COMPONENTS:

- RBCCW HEAT EXCHANGERS
- TBCCW HEAT EXCHANGERS
- TBSCCW HEAT EXCHANGERS
- DIESEL GENERATOR
- SUPPLY TO KEEP ESW PRESSURIZED
- CIRC WATER PUMP SEALS

IF THREE SERVICE WATER PUMPS WERE INITIALLY IN OPERATION, LOSS OF ONE PUMP WILL NOT CAUSE ANY SIGNIFICANT RISE IN COMPONENT TEMPERATURES.

IF TWO SERVICE WATER PUMPS WERE INITIALLY IN OPERATION, THE LOSS OF ONE PUMP WILL RESULT IN A TEMPERATURE RISE IN THE CLOSED COOLING WATER SYSTEMS AND DIESEL GENERATOR (IF RUNNING). THE TEMPERATURES MAY STABLIZE AT A HIGHER VALUE OR RESULT IN THE LOSS OF INDIVIDUAL COMPONENTS. THIS WILL DEPEND UPON THE HEAT EXCHANGE CAPABILITY OF THE AFFECTED HEAT EXCHANGERS.

IF ALL SERVICE WATER IS LOST DUE TO TRIPPING THE REMAINING OPERATING PUMPS, FLOW WILL BE LOST TO THE COMPONENTS SUPPLIED BY SERVICE WATER. THE EFFECTS

SW01

OF LOSS SERVICE WATER FLOW TO THE TBCCW, TBSCCW & RBCCW HEAT EXCHANGERS WILL BE SIMILAR TO A COMPLETE LOSS OF FLOW IN THE INDIVIDUAL SYSTEMS AS DESCRIBED IN MALFUNCTIONS CC01,SC01 & RC01. WITH THE DIESEL GENERATOR RUNNING, LOSS OF SERVICE WATER FLOW WILL RESULT IN A DIESEL GENERATOR TRIP DUE TO HIGH TEMPERATURE. THE LOSS OF THE SUPPLY TO ESW WILL RESULT IN A LOW D/P ALARM AND THE LOSS OF CW PUMP SEALS SUPPLY WILL BE INDICATED BY LOW LUBE WATER FLOW ALARMS.

CONTROL PANEL INDICATIONS:

SERVICE WATER PUMP CURRENT

ANNUNCIATORS:

SERVICE WATER PUMP A OVERLOAD OR TRIP	CRP 906 A2-1 (7-1)
SERVICE WATER PUMPS DISCHARGE PRESSURE LOW	CRP 906 A2-2 (7-5)
LPCI SYS I HX LO TUBE TO SHELL DIFF PRESS	CRP 903 A1 (2-4)
LPCI SYS II HX LO TUBE TO SHELL DIFF PRESS	CRP 903 A2 (2-1)
LUBE WATER FLOW FS-4-2A LO FLOW	CRP 908 A1-1 (6-1)
LUBE WATER FLOW SW FS-4-2B LO FLOW	CRP 908 A1-1 (6-2)
LUBE WATER FLOW SW FS-4-2C LO FLOW	CRP 908 A1-1 (6-3)
LUBE WATER FLOW SW SFS-4-2D LO FLOW	CRP 908 A1-1 (6-3)

B-D SIMILAR TO MALFUNCTION A EXCEPT SERVICE WATER PUMPS B,C & D ARE THE AFFECTED COMPONENTS.

MALFUNCTION REMOVAL WILL RESTORE THE SERVICE WATER PUMP TO NORMAL.

REF: P&ID 26015
CWD SH 151-154
OP 321

SW02 SERVICE WATER STRAINER PLUGGED

VARIABLE (100% = COMPLETE BLOCKAGE)

- SERVICE WATER STRAINER PLUGGED

TYPE: SPECIFIC, VARIABLE (100% = COMPLETE BLOCKAGE)

CAUSE: MARINE GROWTH

PLANT STATUS: 100%

EFFECTS: THE BLOCKAGE WILL RESULT IN REDUCED FLOW THRU THE STRAINER AND AN INCREASE IN STRAINER D/P. THIS WILL RESULT IN A DECREASE IN FLOW TO THE TBCCW, TBSCCW & RBCCW HX'S AND THE DIESEL GENERATOR. ALSO, SERVICE WATER HEADER PRESSURE (COMPUTER POINT SSW002) WILL DECREASE. AUTOMATIC OR MANUAL SELF CLEANING OF THE STRAINER WILL NOT HAVE ANY AFFECT ON THE BLOCKAGE RATE. AS THE STRAINER D/P INCREASES, A HIGH D/P ALARM WILL ACTUATE AT 10 PSID. CHANGES IN SYSTEM FLOW WILL BE INDICATED ON THE PUMP CURRENT METERS.

THE EFFECTS OF THE FLOW REDUCTION THRU THE TBCCW, TBSCCW & RBCCW HX'S WILL BE SIMILAR TO THOSE DESCRIBED IN MALFUNCTION SW01.

THE STRAINER BYPASS VALVE MAY BE OPERATED AT ANYTIME, USING REMOTE FUNCTION SWR01.

CONTROL PANEL INDICATIONS:

SERVICE WATER PUMP CURRENTS

ANNUNCIATOR:

SERVICE WATER STRAINER DIFFERENTIAL PRESS HIGH — CRP 906 A2-2 (8-6)

MALFUNCTION REMOVAL WILL RESULT IN CLEANING THE STRAINER ONLY WHEN REMOTE FUNCTION SWR01 HAS BEEN USED TO FULLY OPEN THE STRAINER BYPASS VALVE.

REF: P&ID 26015
OP 321

SW03 SW ISOL VALVE TO CCW 1-SW-9 FAILURE

VARIABLE (0-100% OF VALVE POSITION)

- SW TO TBCCW 1-SW-9 FAILURE

TYPE: SPECIFIC, VARIABLE (0-100% OF VALVE POSITION)

CAUSE: SHORTING OF 1-1C (OPEN) OR 3-3C (CLOSE) CONTACTS IN CS-162

PLANT STATUS: 100% POWER

EFFECTS: WHEN THIS MALFUNCTION IS ACTIVATED, 1-SW-9 WILL GO TO THE POSITION DESIGNATED BY MALFUNCTION SEVERITY. IF AN ISOLATION SIGNAL IS PRESENT, THE VALVE WILL CYCLE BETWEEN THE FULLY CLOSED POSITION AND THE POSITION DESIGNATED BY MALFUNCTION SEVERITY.

PARTIAL OR FULL CLOSURE OF THE VALVE DURING NORMAL OPERATION WILL RESULT IN A REDUCTION OR LOSS OF SERVICE WATER FLOW TO THE TBCCW HEAT EXCHANGERS. THIS WILL RESULT IN INCREASED TEMPERATURES IN THE TBCCW SYSTEM, THESE EFFECTS WILL BE SIMILAR TO A LOSS OF FLOW IN THE TBCCW SYSTEM AS DESCRIBED IN MALFUNCTION CC01.

MALFUNCTION REMOVAL WILL RESTORE THE VALVE OPERATION TO NORMAL.

REF: P&ID 26015
CWD 162

SW04 LOSS OF SERVICE WATER TO THE EMERG. DIESEL GENERATOR

- LOSS OF SW TO DIESEL GENERATOR

TYPE: SPECIFIC

CAUSE: SERVICE WATER TO DIESEL VALVE (1-SW-99) AIR SOLENOID FAILS TO THE CLOSED POSITION.

PLANT STATUS: 100% POWER, DIESEL GENERATOR TEST IN PROGRESS

EFFECTS: THE SERVICE WATER VALVE 1-SW-99 AUTOMATICALLY OPENS WHEN THE DIESEL GENERATOR IS STARTED. WITH THIS MALFUNCTION ACTIVE 1-SW-99 WILL NOT OPEN WHEN THE DIESEL IS STARTED OR IF ALREADY OPEN IT WILL CLOSE. THIS WILL RESULT IN A LOSS OF COOLING WATER TO THE DIESEL GENERATOR, WHICH WILL CAUSE DIESEL GENERATOR TEMPERATURES TO INCREASE.

THE DIESEL WILL EVENTUALLY TRIP DUE TO HIGH TEMPERATURE. (THIS TRIP IS BYPASSED WITH AN MCA SIGNAL.)

ANNUNCIATORS:

DIESEL GENERATOR COOLANT TEMPERATURE HIGH	CRP 908 A2-2 (1-6)
DIESEL GENERATOR LOCKOUT	CRP 908 A2-1 (1-1)

MALFUNCTION REMOVAL WILL RESTORE THE VALVE OPERATION TO NORMAL.

REF: P&ID 26015

SW05 TBCCW, RBCCW & TBSCCW HX TUBE FOULING

VARIABLE (100% = COMPLETE LOSS OF FLOW)

A - TBCCW HX TUBE FOULING

B - RBCCW HX TUBE FOULING

C - TBSCCW HX TUBE FOULING

TYPE: GENERIC, VARIABLE (100% = COMPLETE LOSS OF FLOW)

CAUSE: MARINE GROWTH

PLANT STATUS: 100% POWER

EFFECTS: THE FOULING OF THE AFFECTED HEAT EXCHANGER WILL RESULT IN A REDUCTION IN TUBE SIDE SERVICE WATER FLOW. THIS WILL CAUSE AN INCREASE OF THE AFFECTED HEAT EXCHANGER SHELL SIDE OUTLET TEMPERATURE, WHICH IN TURN WILL CAUSE INCREASED TEMPERATURES OF THE COOLED COMPONENTS IN THE AFFECTED SYSTEM.

A -- THE OVERALL EFFECTS WILL BE SIMILAR TO A LOSS OF TBCCW SYSTEM FLOW DESCRIBED IN MALFUNCTION CC01 EFFECTS.

B -- THE OVERALL EFFECTS WILL BE SIMILAR TO A LOSS OF RBCCW SYSTEM FLOW DESCRIBED IN MALFUNCTION RC01 EFFECTS.

C -- THE OVERALL EFFECTS WILL BE SIMILAR TO A LOSS OF TBSCCW SYSTEM FLOW DESCRIBED IN MALFUNCTION SC01 EFFECTS.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED HEAT EXCHANGER TO NORMAL. REMOTE FUNCTIONS SWR05-SWR10 SHOULD BE USED TO ISOLATE THE AFFECTED HEAT EXCHANGER BEFORE REMOVING THE MALFUNCTION.

REF: P&ID 26015

SW06 LOSS OF SERVICE WATER PUMP BREAKER CONTROL POWER

A - SW PUMP A LOSS OF CONTROL POWER

B - SW PUMP B LOSS OF CONTROL POWER

C - SW PUMP C LOSS OF CONTROL POWER

D - SW PUMP D LOSS OF CONTROL POWER

TYPE: GENERIC

CAUSE: BLOWN FUSES IN CONTROL CIRCUIT

PLANT STATUS: 100% POWER

EFFECTS: A -- WHEN THIS MALFUNCTION IS INSERTED BOTH FUSES ON THE POSITIVE SIDE OF THE CONTROL CIRCUIT WILL BLOW.

WITH THE FUSES BLOWN, THE PUMP STOP/RUN INDICATION WILL EXTINGUISH AND THE PUMP CANNOT BE STARTED IF STOPPED, OR CANNOT BE SHUT OFF IF IT IS RUNNING.

IF MALFUNCTION SW01A (SW PUMP TRIP) IS INSERTED WITH THIS MALFUNCTION ACTIVE AND WITH SERVICE WATER PUMP A RUNNING, SERVICE WATER PUMP A BREAKER WILL NOT TRIP, HOWEVER, THE OVERCURRENT WILL BE SEEN BY THE 4160 V BUS CAUSING ITS SUPPLY BREAKER TO TRIP. DURING THIS MALFUNCTION SERVICE WATER PUMP A CURRENT INDICATION AND OVERLOAD TRIP ANNUNCIATOR WILL RESPOND WHEN REQUIRED.

B -- SIMILAR TO MALF A, EXCEPT SERVICE WATER PUMP B WILL BE THE AFFECTED COMPONENT.

C -- SIMILAR TO MALF A, EXCEPT SERVICE WATER PUMP C WILL BE THE AFFECTED COMPONENT.

D -- SIMILAR TO MALF A, EXCEPT SERVICE WATER PUMP D WILL BE THE AFFECTED COMPONENT.

MALFUNCTION REMOVAL WILL REPLACE THE BLOWN FUSES.

REF: CWD 151-154

SW07 LPCI HX EMERG. SERVICE WATER D/P CONTROLLER FAILURE

VARIABLE (0-100% CONTROLLER OUTPUT)

- ESW/LPCI A D/P CONTROLLER FAILURE

B - ESW/LPCI B D/P CONTROLLER FAILURE

TYPE: GENERIC, VARIABLE (0-100% CONTROLLER OUTPUT)

CAUSE: CONTROLLER AUTOMATIC OUTPUT ELECTRONIC FAILURE

PLANT STATUS: IN SUPPRESION POOL COOLING

EFFECTS: A -- 100%; ESW FLOW IN THE HEADER WILL INCREASE TO ITS HIGH LIMIT AND GIVE INDICATION OF ESW PUMP CAVITATION (IF ONE PUMP ONLY IS RUNNING) AS LPC-4A OPENS FULLY. HX LO SHELL TO TUBE D/P ANNUNCIATOR ALARMS, AND D/P INDICATION WILL DECREASE. MANUAL OPERATION OF THE CONTROLLER WILL STILL FUNCTION NORMALLY.

0%; ESW FLOW IN THE HEADER WILL DECREASE TO 0 GPM AS LPC-4A CLOSES FULLY. LPCI TEMP OUT OF THE HX INCREASES QUICKLY TO HX INLET TEMP. MANUAL OPERATION OF THE CONTROLLER WILL STILL BE POSSIBLE.

CONTROL ROOM INDICATIONS:

ESW FLOW INDICATOR

LPC-4A VALVE POSITION

CONTROLLER ERROR

HX TEMPERATURE INDICATION

ANNUNCIATORS:

LPCI SYS I HX LO TUBE TO SHELL DIF PRESS	CRP 903 A1 (2-4)

DEACTIVATING THE MALFUNCTION WILL RESTORE THE CONTROLLER TO NORMAL OPERATION.

B -- RESPONSE IS IDENTICAL EXCEPT FOR B

REF: P&ID 26008
CWD 765

TC01 ELECTRIC PRESSURE REGULATOR TRANSDUCER FAILURE

VARIABLE (0-100% TRANSDUCER OUTPUT)

- EPR TRANSDUCER FAILURE

TYPE: VARIABLE (0-100% TRANSDUCER OUTPUT)

CAUSE: MECHANICAL FAILURE OF MAIN STEAM PRESSURE TRANSDUCER DT-4.

PLANT STATUS: 100% POWER

EFFECTS: THE OUTPUT OF THE MAIN STEAM PRESSURE TRANSDUCER WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. USING PROCESS COMPUTER POINT TUR050 SUBTRACT 910, THIS WILL GIVE YOU THE SEVERITY WHICH WILL NOT CAUSE ANY CHANGE IN SERVO POSITION. IF A LOWER SEVERITY IS ENTERED, THE CONTROL SYSTEM WILL RESPOND BY CLOSING THE CONTROL VALVES. REACTOR PRESSURE WILL INCREASE AND THE MECHANICAL PRESSURE REGULATOR WILL TAKE OVER TO LIMIT THE TRANSIENT. THE E.P.R. SERVO WILL DRIVE TO ZERO.

IF THE SEVERITY IS HIGHER THAN TUR050 - 910, THE CONTROL VALVES WILL OPEN TO THE MECHANICAL "REACTOR FLOW LIMIT" STOP. REACTOR PRESSURE WILL DECREASE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE PRESSURE TRANSDUCER.

CONTROL ROOM INDICATIONS:

EPR SERVO POSITION

TURBINE CONTROL VALVE POSITION

REACTOR PRESSURE

REF: CWD 49
GE TURBINE MANUAL
OP 314

TC02 ELECTRIC PRESSURE REGULATOR OSCILLATION

VARIABLE (100% = 100 PSI SWING)

- EPR OSCILLATION

TYPE: VARIABLE (100% = 100 PSI SWING)

CAUSE: ELECTRONIC MALFUNCTION

PLANT STATUS: 100% POWER

EFFECTS: THE E.P.R. CONTROL SIGNAL INTO THE LEAD/LAG CIRCUIT WILL OSCILLATE ABOUT THE NORMAL SETPOINT BY THE INSTRUCTOR SPECIFIED PEAK-TO-PEAK PRESSURE SWING. THE PERIOD OF OSCILLATION WILL BE ABOUT THREE SECONDS. IF THE LOWER PEAK DROPS BELOW THE M.P.R. INPUT TO THE HIGH VALUE GATE, THE M.P.R. WILL ATTEMPT TO CONTROL PRESSURE AND, IF THE M.P.R. IS SET CLOSE TO THE E.P.R., MAY CAUSE THE E.P.R. OUTPUT TO DECAY TO ZERO.

IF NEAR THE REACTOR FLOW LIMIT, THE EFFECTS OF THE UPPER PEAK WILL BE CLIPPED BY THE LIMITER.

THE PRESSURE OSCILLATIONS WILL CAUSE CORRESPONDING OSCILLATIONS IN REACTOR POWER AND MAY CAUSE A REACTOR SCRAM ON HIGH POWER.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE E.P.R. CONTROL SIGNAL TO NORMAL.

CONTROL ROOM INDICATIONS:

E.P.R. SERVO POSITION

GENERATOR LOAD

REACTOR PRESSURE

REACTOR POWER

REF: CWD 49
GE TURBINE MANUAL
OP 314

TC03 MECHANICAL PRESSURE REGULATOR TRANSDUCER FAILURE

VARIABLE (0-100% OF RANGE)

- MPR TRANSDUCER FAILURE

TYPE: VARIABLE (0-100% OF RANGE)

CAUSE: FAILURE OF THE MECHANICAL PRESSURE SENSOR

PLANT STATUS: 100% POWER

EFFECTS: THE PRESSURE INPUT TO THE MECHANICAL PRESSURE SETPOINT COMPARATOR WILL GO TO THE INSTRUCTOR SPECIFIED VALUE. USING PROCESS COMPUTER POINT TUR050, SUBTRACT 150 AND DIVIDE BY 9; THIS WILL GIVE THE SEVERITY WHICH WILL NOT CAUSE ANY CHANGE IN SERVO POSITION. IF A HIGHER SEVERITY IS USED, AND THE M.P.R. CONTROL SIGNAL BECOMES HIGHER THAN E.P.R. SIGNAL, IT WILL CAUSE THE CONTROL VALVES TO OPEN, REACTOR PRESSURE WILL DECREASE AND THE E.P.R. WILL DRIVE LOW. IF A LOWER SEVERITY IS USED WHILE THE MPR IS IN SERVICE CONTROL VALVES WILL CLOSE AND PRESSURE WILL INCREASE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE M.P.R. PRESSURE SENSOR.

CONTROL ROOM INDICATIONS:

M.P.R. OUTPUT STROKE INDICATOR

REF: GE TURBINE MANUAL

TC04 MECHANICAL PRESSURE REGULATOR OSCILLATION

VARIABLE (100% = 100 PSI SWING)

- MPR OSCILLATION

TYPE: VARIABLE (100% = 100 PSI SWING)

CAUSE: CONTROL MECHANISM FAILURE

PLANT STATUS: 100% POWER

EFFECTS: THE M.P.R. CONTROL INPUT TO THE LEAD/LAG MECHANISM WILL OSCILLATE ABOUT THE NORMAL SETPOINT BY THE INSTRUCTOR SPECIFIED PEAK-TO-PEAK PRESSURE SWING. THE PERIOD OF OSCILLATION WILL BE ABOUT THREE SECONDS. IF THE UPPER PEAK EXCEEDS THE E.P.R. INPUT TO THE HIGH VALUE GATE, THE CONTROL VALVES WILL OPEN AND THE E.P.R. WILL DECREASE ITS SIGNAL IN AN ATTEMPT TO RECOVER PRESSURE. THE E.P.R. MAY CONTINUE IN SYMPATHETIC OSCILLATIONS OR IT MAY DRIVE TO ZERO DEPENDING ON THE RELATIONSHIP OF THE TWO PRESSURE SETPOINTS.

IF NEAR THE REACTOR FLOW LIMIT, THE EFFECTS OF THE UPPER PEAK WILL BE CLIPPED BY THE LIMITER.

REMOVAL OF THIS MALFUNCTION WILL RESTORE THE M.P.R CONTROL INPUT TO NORMAL.

CONTROL ROOM INDICATIONS:

M.P.R. OUTPUT STROKE

GENERATOR LOAD

REACTOR PRESSURE

REACTOR POWER

REF: G.E. TURBINE MANUAL

TC05 TURBINE CONTROL VALVE FAILURE

VARIABLE (0-100% VALVE POSITION)

A - CONTROL VALVE #1 FAILURE

B - CONTROL VALVE #2 FAILURE

C - CONTROL VALVE #3 FAILURE

D - CONTROL VALVE #4 FAILURE

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: VALVE SERVO-MOTOR FAILURE

PLANT STATUS: 100% POWER

EFFECTS: A -- CONTROL VALVE #1 SERVO WILL GO TO THE INSTRUCTOR SPECIFIED POSITION. TURBINE LOAD AND STEAM FLOW WILL RESPOND AND THE PRESSURE CONTROL SYSTEM WILL MODULATE THE OTHER CONTROL VALVES TO CONTROL REACTOR PRESSURE. IF THE VALVE CLOSES MORE THAN THE OTHER VALVES CAN OPEN, THE BYPASS VALVES WILL OPEN.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL CONTROL VALVE OPERATION.

CONTROL ROOM INDICATIONS:

CONTROL VALVE POSITIONS

REACTOR PRESSURE

B-D SIMILAR TO MALF. A.

REF: GE TURBINE MANUAL

TC06 TURBINE BYPASS VALVE FAILURE

VARIABLE (0-100% VALVE POSITION)

A - BYPASS VALVE #1 FAILURE

B - BYPASS VALVE #2 FAILURE

C - BYPASS VALVE #3 FAILURE

D - BYPASS VALVE #4 FAILURE

E - BYPASS VALVE #5 FAILURE

F - BYPASS VALVE #6 FAILURE

G - BYPASS VALVE #7 FAILURE

H - BYPASS VALVE #8 FAILURE

J - BYPASS VALVE #9 FAILURE

K - BYPASS VALVE #10 FAILURE

TYPE: GENERIC, VARIABLE (0-100% VALVE POSITION)

CAUSE: VALVE SERVO-MOTOR FAILURE

PLANT STATUS: 100% POWER

EFFECTS: A -- BYPASS VALVE #1 WILL GO TO THE INSTRUCTOR SPECIFIED POSITION. THE VALVE POSITION LIGHTS WILL INDICATE INTERMEDIATE OR FULLY OPEN, BUT THE COMBINED BYPASS VALVE POSITION INDICATOR WILL CONTINUE TO SHOW THE CORRECT BYPASS VALVE DEMAND. REACTOR PRESSURE WILL DECREASE AND THE PRESSURE CONTROL SYSTEM WILL CLOSE THE TURBINE CONTROL VALVES TO RESTORE PRESSURE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL BYPASS VALVE OPERATION.

CONTROL ROOM INDICATIONS:

BYPASS VALVE POSITION LIGHTS

GENERATOR LOAD

B-K SIMILAR TO MALF. A.

REF: CWD 44
GE TURBINE MANUAL

TC07 TURBINE FAILS TO TRIP

A - TURBINE VACUUM TRIP #1 FAILS

B - TURBINE EMERG TRIP VALVE FAILS

TYPE: GENERIC

CAUSE: MECHANICAL FAILURE

PLANT STATUS: 100% POWER

EFFECTS: A -- WHEN CONDITIONS OCCUR WHICH SHOULD CAUSE VACUUM TRIP #1 TO TRIP, INCLUDING MANUAL TRIP, THE TRIP PISTON WILL NOT SHIFT. OIL WILL STILL BE SUPPLIED TO THE EMERGENCY TRIP VALVE IF IT HAS NOT TRIPPED. THE VACUUM TRIP #1 INDICATING LIGHT WILL NOT ILLUMINATE, BUT IF THE LOW VACUUM TRIP CONDITION IS PRESENT THAT ANNUNCIATOR WILL STILL ACTUATE. THE EMERGENCY TRIP VALVE WILL STILL BE CAPABLE OF TRIPPING THE TURBINE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE TRIP PISTON.

B -- WHEN CONDITIONS OCCUR WHICH SHOULD CAUSE THE EMERGENCY TRIP VALVE TO TRIP, THE VALVE WILL NOT SHIFT. TRIP OIL WILL STILL BE SUPPLIED TO ALL RELAYS IF VACUUM TRIP #1 HAS NOT TRIPPED. THE TURBINE OVERSPEED TRIP INDICATING LIGHT AND ANNUNCIATOR WILL NOT ACTUATE. VACUUM TRIP #1 WILL STILL BE CAPABLE OF TRIPPING THE TURBINE.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE TRIP VALVE.

REF: GE TURBINE MANUAL

TC08 TURBINE TRIP

- TURBINE TRIP (EMERG GOVERNOR FALURE)

TYPE: SPECIFIC

CAUSE: EMERGENCY GOVENOR TRIP VALVE LATCH FAILURE

PLANT STATUS: 100% POWER

EFFECTS: THE EMERGENCY TRIP VALVE WILL SHIFT CAUSING THE TURBINE TO TRIP. THE OVERSPEED TRIP INDICATING LIGHT AND ANNUNCIATOR WILL ACTUATE. THE REACTOR WILL SCRAM AS THE TURBINE STOP VALVES CLOSE.

ATTEMPTING TO RESET THE MASTER TRIP WILL CAUSE THE TRIP INDICATING LIGHT TO EXTINGUISH AND THE ANNUNCIATOR TO CLEAR, BUT THE DEVICE WILL TRIP AGAIN WHEN THE SWITCH IS RETURNED.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE EMERGENCY TRIP VALVE MECHANISM.

ANNUNCIATORS:

TURBINE OVERSPEED TRIP	CRP 907 A1-2 (1-5)

REF: CWD 73
GE TURBINE MANUAL

TC09 TURBINE GOVERNOR (LOAD DEMAND) FAILS HIGH

- TURBINE LOAD DEMAND FAILS HIGH

TYPE: SPECIFIC

CAUSE: PLUGGED DRAIN PORT IN THE SPEED GOVERNOR

PLANT STATUS: TURBINE STARTUP

EFFECTS: CONTROL OIL PRESSURE TO THE SPEED RELAY WILL STEADILY INCREASE CAUSING THE SPEED/LOAD SIGNAL TO THE CONTROL VALVES TO BEGIN INCREASING AT 5%/SECOND. WITH THE SPEED/LOAD SIGNAL CONTROLLING, THE CONTROL VALVES WILL BEGIN OPENING CAUSING THE TURBINE TO ACCELERATE AND TRIP ON OVERSPEED. IF ON-LINE, LOAD WILL INCREASE AND REACTOR PRESSURE WILL DECREASE CAUSING THE PRESSURE CONTROLLER TO CLOSE THE BYPASS VALVES AND ASSUME CONTROL OF TURBINE LOAD.

IF THE TURBINE-GENERATOR IS ON-LINE THE WITH THE PRESSURE CONTROL SIGNAL CONTROLLING THE CONTROL VALVE POSITION, THE ONLY EFFECT WILL BE THE SPEED RELAY GOING TO THE LOAD LIMIT STOP.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL DRAIN FLOW ALLOWING THE SPEED/LOAD SIGNAL TO RETURN TO NORMAL AT 5%/SECOND.

CONTROL ROOM INDICATIONS:

TURBINE SPEED AND ACCELERATION

REF: CWD 61
GE TURBINE MANUAL

TU01 TURBINE LUBE OIL PUMP FAILURE

A - AUX OIL PUMPS A & B TRIP

B - TURNING GEAR OIL PUMP TRIP

C - EBOP OVERLOAD (TRIPS AFTER 30 MINUTES)

TYPE: GENERIC

CAUSE: MOTOR OVERLOAD OR SHORT CIRCUIT

PLANT STATUS: ANY

EFFECTS: A -- IF RUNNING, OR WHEN STARTED, THE INSTANTANEOUS OVERCURRENT DEVICE (50) WILL TRIP, BOTH A.O.P. MOTORS WILL BE DEENERGIZE AND THE PUMP TRIPPED ANNUNCIATOR WILL ACTUATE.

IF THE TURBINE IS RUNNING ABOVE ABOUT 1620 RPM, NO OTHER EFFECTS WILL BE SEEN. IF BELOW ABOUT 1620 RPM OIL HEADER PRESSURE WILL DECREASE CAUSING THE TURNING GEAR OIL PUMP TO START AUTOMATICALLY AND THE HYDRAULIC OIL PRESSURE LOW ANNUNCIATOR TO ACTUATE. THE TURBINE CONTROL SYSTEM VALVES AND THE GLAND SEAL REGULATOR WILL FAIL.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17 WILL RESTORE NORMAL OPERATION OF THE PUMP.

B -- IF RUNNING, OR WHEN STARTED, THE THERMAL OVERLOAD DEVICE (49) WILL TRIP, THE T.G.O.P. WILL TRIP AFTER APPROXIMATELY 60 SECONDS, INDICATING LIGHTS WILL GO OUT, AND THE PUMP TRIPPED ANNUNCIATOR WILL ACTUATE. AS OIL PRESSURE DECREASES THE EMERG OIL PUMP WILL AUTOMATICALLY START AND THE RED LIGHT WILL GO OUT AS OIL PRESSURE RECOVERS. IF THE AUX. OIL PUMPS OR SHAFT OIL PUMP ARE SUPPLYING OIL, NO EFFECTS WILL BE SEEN FROM THIS MALFUNCTION.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17, WILL RESTORE NORMAL OPERATION OF THE PUMP.

C -- IF RUNNING, OR WHEN STARTED, THE THERMAL OVERLOAD DEVICE (49) WILL TRIP BUT THE E.B.O.P. WILL NOT STOP. BOTH INDICATING LIGHTS WILL STILL FUNCTION AND THE PUMP TRIPPED AND PUMP RUNNING ANNUNCIATORS WILL BOTH ACTUATE.

TU01

IF THE PUMP CONTINUES TO RUN IN THIS CONDITION FOR ABOUT 30 MINUTES, THE MOTOR SUPPLY BREAKER WILL TRIP. THE PUMP WILL STOP AND THE INDICATING LIGHTS WILL GO OUT.

REMOVAL OF THIS MALFUNCTION AND RESET OF THE OVERCURRENT DEVICE WITH REMOTE FUNCTION EDR17, WILL RESTORE NORMAL OPERATION OF THE PUMP.

CONTROL ROOM INDICATIONS:

PUMP STATUS LIGHTS

TURBINE LUBE OIL PRESSURES

TURBINE CONTROL SYSTEM VALVE POSITIONS

ANNUNCIATORS:

TURBINE AUXILIARY OIL PUMP OVERLOAD OR TRIP	CRP 907 A1-1 (4-3)
TURBINE HYDRAULIC OIL PRESSURE LOW	CRP 907 A1-1 (3-1)
TURNING GEAR OIL PUMP MOTOR OVERLOAD	CRP 907 A1-2 (4-7)
EMERGENCY BEARING OIL PUMP OVERLOAD	CRP 907 A1-2 (5-7)
EMERGENCY BEARING OIL PUMP RUNNING	CRP 907 A1-2 (5-6)

REF: CWD 95-97
GE TURBINE MANUAL
OP 314

TU02 LOSS OF TURBINE SHAFT LUBE OIL PUMP DISCH PRESSURE

VARIABLE (100% = COMPLETE FLOW BLOCKAGE)

- LOW SHAFT OIL PUMP DISCHARGE PRESSURE

TYPE: VARIABLE (100% = COMPLETE FLOW BLOCKAGE)

CAUSE: OBSTRUCTION IN PUMP DISCHARGE PIPING IMMEDIATELY DOWNSTREAM FROM THE PUMP.

PLANT STATUS: 100% POWER

EFFECTS: THE FLOW BLOCKAGE WILL CAUSE HYDRAULIC OIL PRESSURE AND BEARING OIL PRESSURE TO DECREASE. BELOW 190 PSIG THE AUXILIARY OIL PUMPS WILL START. THE TURBINE WILL BE ABLE TO RUN IN THIS CONDITION INDEFINITELY. THE SLIGHTLY LOWER OIL FLOWS WILL CAUSE BEARING TEMPERATURES TO INCREASE SLIGHTLY, BUT NO ALARMS SHOULD OCCUR.

REMOVAL OF THIS MALFUNCTION WILL REMOVE THE BLOCKAGE AND RESTORE NORMAL OPERATION OF SYSTEM.

CONTROL ROOM CONDITIONS:

HYDRAULIC OIL PRESSURE

BEARING OIL HEADER PRESSURE

TURBINE BEARING TEMPERATURES

ANNUNCIATORS:

TURBINE HYDRAULIC OIL PRESSURE LOW	CRP 907 A1-1 (2-1)
TURBINE AUXILIARY OIL PUMP AUTO START	CRP 907 A1-1 (4-4)

REF: CWD 70
GE TURBINE MANUAL
OP 314

TU03 LOSS OF LUBE OIL TO TURBINE BEARING

VARIABLE (100% = 75% FLOW BLOCKAGE)

A - TURB BEARING #1 LOW OIL FLOW

B - TURB BEARING #2 LOW OIL FLOW

C - TURB BEARING #3 LOW OIL FLOW

D - TURB BEARING #4 LOW OIL FLOW

E - TURB BEARING #5 LOW OIL FLOW

F - TURB BEARING #6 LOW OIL FLOW

G - TURB BEARING #7 LOW OIL FLOW

H - TURB BEARING #8 LOW OIL FLOW

J - TURB BEARING #9 LOW OIL FLOW

K - TURB BEARING #10 LOW OIL FLOW

TYPE: GENERIC, VARIABLE (100% = 75% FLOW BLOCKAGE)

CAUSE: OBSTRUCTION IN BEARING OIL SUPPLY PIPING

PLANT STATUS: 100% POWER

EFFECTS: A -- THE REDUCED FLOW WILL CAUSE THE BEARING TEMPERATURE TO INCREASE. WHEN BEARING TEMPERATURE OR BEARING OIL DRAIN TEMPERATURE EXCEEDS 160 DEG., THE HIGH TEMPERATURE ANNUNCIATOR WILL ACTUATE. AS THE OIL TEMPERATURE INCREASES, ITS LUBRICATING PROPERTIES WILL DECREASE CAUSING THE HEAT GENEATED BY FRICTION IN THE BEARING TO INCREASE. BEARING METAL TEMPERATURE WILL INCREASE FASTER THAN OIL DRAIN TEMPERATURE.

IF BEARING METAL TEMPERATURE EXCEEDS ABOUT 300 DEG. THE BEARING WILL WIPE. INDICATED TEMPERATURE WILL SPIKE SUDDENLY AS THE BABBIT MELTS. THE INCREASED FLOW AREA THROUGH THE BEARING WILL ALLOW INCREASED OIL FLOW AND THE LOSS OF FRICTION WILL ALLOW BEARING METAL TEMPERATURE TO DECREASE RAPIDLY. THE TEMPERATURE SPIKE MAY NOT BE SEEN ON THE MULTI-POINT RECORDER DUE TO THE LONG TIME BETWEEN MONITORING INDIVIDUAL POINTS. THE LOAD WHICH WAS CARRIED BY THIS BEARING WILL BE PICKED UP BY THE ADJACENT BEARINGS WHICH WILL SHOW A NOTICEABLE TEMPERATURE INCREASE. TURBINE VIBRATION WILL ALSO SHOW A SIGNIFICANT INCREASE AS THE AFFECTED BEARING WIPES.

TU03

THE ADJACENT BEARING VIBRATION WILL ALSO SHOW NOTICEABLE [illegible]REASES.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OIL FLOW TO THE BEARING. IF THE BEARING HAS WIPED, THE SIMULATOR MUST BE REINITIALIZED TO REMOVE THE RESULTING EFFECTS.

CONTROL ROOM INDICATIONS:

TURBINE BEARING OIL TEMPERATURES

TURBINE BEARING METAL TEMPERATURES

TURBINE BEARING VIBRATION

ANNUNCIATORS:

TURB OIL COOLER OR BRG. DRAIN OIL TEMP HI	CRP 907 A1-1 (5-1)
TURB. BEARING HI TEMPERATURE	CRP 907 A1-1 (5-2)

B-K -- SIMILAR TO MALF A.

REF: CWD 37,46A
GE TURBINE MANUAL
OP 314

TU04 TURBINE BEARING HIGH VIBRATION

VARIABLE (100% = 20 MILS)

A - TURB BEARING #1 HI VIBRATION

B - TURB BEARING #2 HI VIBRATION

C - TURB BEARING #3 HI VIBRATION

D - TURB BEARING #4 HI VIBRATION

E - TURB BEARING #5 HI VIBRATION

F - TURB BEARING #6 HI VIBRATION

G - TURB BEARING #7 HI VIBRATION

H - TURB BEARING #8 HI VIBRATION

J - TURB BEARING #9 HI VIBRATION

K - TURB BEARING #10 HI VIBRATION

TYPE: GENERIC, VARIABLE (100% = 20 MILS)

CAUSE: ROTOR UNBALANCE

PLANT STATUS: 100% POWER

EFFECTS: A -- NORMAL BEARING VIBRATION WILL INCREASE BY THE INSTRUCTOR SPECIFIED AMOUNT. THE VIBRATION LEVELS OF ADJACENT BEARINGS WILL ALSO INCREASE. THE HIGH VIBRATION ANNUNCIATOR WILL ACTUATE AS VIBRATION EXCEEDS 8 MILS, BUT NO TRIPS WILL OCCUR. BEARING TEMPERATURES WILL INCREASE NOTICEABLE DUE TO THE VIBRATION.

IF THIS MALFUNCTION IS ACTIVE WHILE THE TURBINE IS PASSING THROUGH CRITICAL SPEEDS, THE PEAK AMPLITUDES WILL BE PROPORTIONATELY HIGHER THAN NORMAL. (E.G., IF NORMAL VIBRATION IS 2 MILS AND THE MF SEVERITY IS 40%, OR 8 MILS, THEN THE CRITICAL SPEED PEAK AMPLITUDE WILL BE FOUR TIMES THE NORMAL PEAK.)

REMOVAL OF THIS MALFUNCTION WILL RESTORE ROTOR BALANCE.

B-K SIMILAR TO MALF. A

CONTROL ROOM INDICATIONS:

TURBINE VIBRATION TRENDS

TU04

TURBINE BEARING TEMPERATURES

ANNUNCIATORS:

TURBINE VIBRATION EXCESSIVE	CRP 907 A1-1 (2-3)

REF: CWD 70
GE TURBINE MANUAL
OP 314

TU05 TURBINE LIFT PUMP FAILURE TO RUN IN AUTO

A - LIFT PUMP #1 FAILS TO RUN IN AUTO

B - LIFT PUMP #2 FAILS TO RUN IN AUTO

C - LIFT PUMP #3 FAILS TO RUN IN AUTO 6 & 8

D - LIFT PUMP #4 FAILS TO RUN IN AUTO 5 & 7

TYPE: GENERIC

CAUSE: AUTO-START CONTACTS ON RELAY LSS-X FAIL OPEN.

PLANT STATUS: SHUTDOWN

EFFECTS: A -- WHEN THE TURBINE STOPS ROLLING, THE LIFT PUMP MOTOR #1 WILL NOT START AUTOMATICALLY WHEN THE TURNING GEAR STARTS. THE LIFT PUMP LOW PRESSURE ANNUNCIATOR WILL ACTUATE AND THE NORMAL PRESSURE INDICATING LIGHTS FOR BEARINGS 2 AND 3 WILL NOT ILLUMINATE.

IF THE OPERATOR MANUALLY STARTS THE LIFT PUMPS BEFORE THE TURBINE STOPS, NO EFFECTS WILL BE SEEN FROM THIS MALFUNCTION REMOVAL OF THIS MALFUNCTION WILL RESTORE THE RELAY CONTACTS TO NORMAL.

CONTROL ROOM INDICATIONS:

LIFT PUMP PRESSURE STATUS LIGHTS

ANNUNCIATORS:

TURBINE LIFT PUMP PRESSURE LOW	CRP 907 A1-2 (3-5)

B-D SIMILAR TO MALF A.

REF: CWD 98
GE TURBINE MANUAL
OP 314

TU06 THRUST BEARING WEAR DETECTOR LOCKOUT FAILURE

A - TURBINE END TB WEAR DET LOCKOUT FAILS

B - GEN END TB WEAR DET LOCKOUT FAILS

TYPE: GENERIC

CAUSE: DETECTOR TEST POSITION SWITCH TWS-11 OR -12 FAILS OPEN

PLANT STATUS: ANY, TURBINE RESET

EFFECTS: A -- WHEN THE THRUST BEARING WEAR DETECTOR IS TESTED TO THE TURBINE END, THE LOCKOUT LIGHT WILL NOT COME ON AS THE INDICATOR MOVES AWAY FROM ZERO. WHEN THE INDICATOR REACHES 35 MILS THE TURBINE WILL TRIP. WHEN THE SWITCH IS RETURNED TO NORMAL, THE DETECTOR WILL NOT RETURN TO ZERO BUT WILL REMAIN AT ITS PRESENT POSITION.

IF THE TRIP HAS NOT OCCURRED, THEN PLACING THE TEST SWITCH TO THE GENERATOR END WILL DRIVE THE DETECTOR IN THE NEGATIVE DIRECTION BACK TO ZERO AND THEN TEST THE GENERATOR END NORMALLY.

REMOVAL OF THIS MALFUNCTION WILL RESTORE NORMAL OPERATION OF THE DETECTOR POSITION SWITCH. THE DETECTOR WILL RETURN TO ZERO AND THE TURBINE TRIP MAY BE RESET.

CONTROL ROOM INDICATIONS:

LOCKOUT INDICATING LIGHT

THRUST BEARING WEAR INDICATOR

TURBINE TRIP

ANNUNCIATORS:

TURBINE THRUST BEARING FAILURE TRIP	CRP 907 A1-1 (1-4)

B -- SIMILAR TO MALF. A.

REF: CWD 64,70
OP 314
GE TURBINE MANUAL