Preliminary 20

TEST RESULTS REPORT

PROCEDURE NO. 91HF-1SG01

PROCEDURE TITLE MAIN STEAM ISOLATION VALVES AND BYPASS VALVES HOT FUNCTIONAL TEST

REVISION AT THE COMMENCEMENT OF TESTING 0 DATE 6/1/83

REVISION AT COMPLETION OF TESTING 0 DATE 6/1/83

LATEST TEST CHANGE NOTICE NO. 15 DATE 7/3/83

DATES OF TEST PERFORMANCE 6/2/83 THROUGH 7/3/83

Review and Approval of Test Results

PREPARED BY: E T Chilcoat Jr. DATE 8-17-83

TECHNICAL REVIEW: [signature] DATE 8/17/83

GROUP SUPERVISOR REVIEW: [signature] DATE 8-25-83

TEST WORKING GROUP MEETING NUMBER: _____ DATE _____

PLANT REVIEW BOARD MEETING NUMBER: _____ DATE _____

QUALITY ASSURANCE REIVEW: _____ DATE _____
(Required for Test Results Reports not reviewed by TWG)

STARTUP MANAGER APPROVAL: _____ DATE _____

54-525

A. TEST PURPOSE AND SCOPE

The intent of this Precore Hot Functional Test was to demonstrate the operation of the four Main Steam Isolation Valves (MSIV's), two MSIV Bypass valves and the six Main Steam Trap Isolation valves using the "A" and "B" train normal and Main Steam Isolation Signal (MSIS) control circuitry at Hot Standby conditions (RCS: 565°F, 2250 psia; Secondary: 565°F, 1170 psia). This included a preliminary hot steam flush through each of the four MSIV's, a loss of power response verification, and a MSIS ("A" and "B" trains) response time test for each of the twelve valves, including a verification of the MSIS override feature.

B. COMPLEMENTARY TESTS

91PE-1SG01, Main Steam Isolation Valves and Bypass Valves Preoperational Test

91PE-1SG04, Steam Generator Isolations

91HF-1SF03, Precore Turbine Bypass Control System

90HF-1ZZ01, Precore Hot Functional Testing Controlling Document

91HF-1ZZ11, Safety Related Valve Response Time at Design Conditions

C. TEST DESCRIPTION

The test methodologies used can be divided into the four categories described below:

1) Hot steam flushes were performed by first opening only the MSIV to be flushed through and the opposing steam generator MSIV Bypass valve, then opening the Steam Bypass Control System Valve 13JN-PV-1006 to the condenser to control the flush. This testing evolution was performed in conjunction with 91HF-1SF03, Turbine Steam Bypass Control System. The hot steam flushes were performed for equipment protection only and therefore did not have any acceptance criteria associated with them.

2) Valve operability testing was performed on all 12 valves using the respective normal control switches located on the main control room panels and observing the valve response.

3) Valve response to loss of power was performed on all 12 valves by momentarily interrupting the respective power source using control power switches, disconnect switches or lifting the energized cables and observing the valve response.

4) MSIS valve response time testing was performed on all 12 valves by initiating the respective MSIS signal using the temporary ESFAS switches installed per 92SU-1SA01, ESFAS Switch Installation and Removal, and using a multi channel strip chart recorder to record MSIS signal and valve position versus time.

D. TEST EVENTS

This Precore Hot Functional Test commenced at 2000 hours on June 2, 1983 and concluded (with open TER's) at 1035 hours on July 3, 1983. The test did not run continuously during this time period due to other testing in progress, plant/equipment availability and various repairs/modifications required on the MSIV and MSIV Bypass valves. However, this discontinuity did not adversely affect the technical aspect of the procedure since it was structured on a discrete subsection basis.

The MSIV's underwent considerable maintenance and repair immediately prior to and during the initial performance of the test. Most of the repairs centered around the MSIV hydraulic actuators (oil leaks, oil reservoir overflowing, the valve drifting open from the closed position, booster pump failures) and modifications to the MSIV limit switches (See NCR-SM1956).

Significant oil reservoir overflow problems continued to occur during the testing of the Fast Open feature of the MSIV's. This problem resulted in TER 07, SFR-1SG-158 and TCN 13 (scope intent). The SFR resolution was to remove the Fast Open feature from all four MSIV's and delete the testing requirement from the procedure. TCN 13 removed the testing requirement from the procedure.

Also, initially neither SG-UV-169 nor SG-UV-183 could meet the response time test acceptance criteria for the "B" Train MSIS actuation. This resulted in TER 01, SFR-1SG-133 and NCR-SJ-2221. The problem was resolved by retubing the "A" and "B" solenoid valve air lines. Following the modification SG-UV-169 and SG-UV-183 met the acceptance criteria for the MSIS Response Time Test.

The hot steam flushes through the four MSIV's were restricted to maximum -25°F change in RCS temperature. In most cases the RCS temperature change was kept to 10 - 15°F at the discretion of the Test Director for each of the three flushes per line. This was done to reduce the recovery time of the RCS and thereby expedite the overall testing program.

On June 30, 1983, TCN 08 (modified by TCN 10) and TCN 11 received interim approval then were entered into the procedure. These TCN's incorporated a verification of the Safety Equipment Status System (SESS) panel operation for the four MSIV's and the two MSIV Bypass Valves. The SESS panel operation was not originally included in the procedure as the forecast system completion status indicated the equipment would not be ready during the scheduled test period of the Precore HFT. Three TER's that were generated due to improper operation of the SESS remained open at the conclusion of Precore HFT. The retesting associated with these TER's will have to be performed during Post Core HFT. See Section G, Recommendations, 1) Additional Testing, of this TRR for details.

E. TEST RESULTS

All acceptance criteria were met except the "B" Train Exercise Mode for SG-UV-170. The failure of SG-UV-170 to meet the "B" Train Exercise Mode acceptance criteria (2.1.2.2) resulted in TER 08 which remained open at the conclusion of Precore HFT.

The Fast Open operations (acceptance criteria 2.5.1.2, 2.5.2.2, 2.5.3.2, 2.5.4.2, 2.5.1.3, 2.5.2.3, 2.5.3.3, 2.5.4.3) from both the "A" and "B" Trains for all four MSIV's resulted in TER 07, SFR-1SG-156 and DCPs 1SJ/2SJ/3CJ-SG-087. The approved resolution for the SFR was to remove the Fast Open feature and delete the testing requirement from the test procedure. TCN 13 deleted the testing requirements including the associated acceptance criteria from the test procedure.

Appendix A presents the acceptance criteria versus valve number in a tabular format. The convention used was the acceptance criteria step number listed above the acceptance criteria status were "pass" indicates the acceptance criteria was met, "TER ##" indicates the acceptance criteria failed and a TER was generated, "TCN ##" indicates the acceptance criteria was deleted from the procedure; and for response times the actual value in seconds is provided for convenience and comparison.

The following TER's were generated during the performance of 91HF-1SG01:

TER 01: Step 8.9.5.24; SG-UV-169 did not pass the MSIS "B" Train response time acceptance criteria of less than or equal to 5.0 seconds. SFR-1SG-133 and NCR-SJ2221 were generated. The "A" and "B" solenoid valve air lines were rerouted per the SFR resolution. SG-UV-169 passed the acceptance criteria on the subsequent retest.

TER 02: Step 8.9.6.10; SG-UV-183 did not pass the MSIS "A" Train response time acceptance criteria of less than or equal to 5.0 seconds. Upon investigation it was discovered that the "A" or "B" Train solenoid valve control circuitry was wired backwards. This made it an identical problem to that of TER 01. The control circuitry was rewired per the EE 580 and the air lines rerouted per SFR-1SG-133. SG-UV-183 passed the acceptance criteria on the subsequent retest.

TER 03: Steps 8.11.3.10 and 8.11.3.11; during the response time testing of SG-UV-1135A and SG-UV-1135B, the strip chart recorder failed to provide a useable timing signal. The resolution of the TER was TCN 07 which changed the signal connection points for the recorder input. Both SG-UV-1135A and SG-UV-1135B passed the acceptance criteria on the subsequent retest.

TER 04: Step 8.9.1.32.1; SG-UV-170 discrepancy status (Blue) light did not extinguish during the MSIS "B" Train actuation test. This step was entered per TCN 08 and did not reflect the actual design of the SESS logic circuitry. The resolution of the TER was TCN 10 which deleted the step and added the correct steps to the procedure. The required retest was not performed prior to the conclusion of Precore HFT Testing.

TER 05: Step 8.9.2.18.1; SG-UV-180 discrepancy status (Blue) light did not extinguish during the MSIS "A" Train actuation test. This step was entered per TCN 08 and did not reflect the actual design of the SESS logic circuitry. This TER was written prior to the entry of TCN 10. The resolution of the TER was TCN 10 which deleted the step and added the correct steps to the procedure. The required retest was not performed prior to the conclusion of Precore HFT Testing.

TER 06: Step 8.9.2.30.1; SG-UV-180 discrepancy status (Blue) light did not illuminate during the MSIS "B" Train actuation test. Initial investigation indicates the problem is mechanical or instrumentation related and not procedural, since similar indicator lights worked properly on the other three MSIV's. The resolution is complete but was not completed prior to the conclusion of Precore HFT Testing. Therefore, the required retest is still an outstanding item.

TER 07: Steps 8.6.1.5, 8.6.1.7, 8.6.2.5, 8.6.2.7, 8.6.3.5, 8.6.3.7, 8.6.4.5, 8.6.4.7; addresses the testing of the MSIV Fast Open feature. This TER generated SFR-1SG-158. The approved resolution to the SFR was to remove the MSIV Fast Open feature from all four MSIV's per DCPs 1SJ/2SJ/3CJ-SG-087 and delete the testing requirements from the procedure. TCN 13 deleted the testing requirements including the associated acceptance criteria from the procedure. Therefore, this TER is closed and requires no retest.

TER 08: Step 8.2.2.8; SG-UV-170 did not return to the open position during the Excercise Mode Testing and the related (Blue) indicator light did not extinguish. Initial investigation indicated the problem is mechanical or instrumentation related and not procedural since similar functions worked properly on the other three MSIV's and during the performance of 91PE-1SG01. The resolution is complete but was not completed prior to the conclusion of the Precore HFT Testing. Therefore, the required retest is still an outstanding item.

TER 09: Steps 8.6.1.4, 8.6.2.4, 8.6.3.4, 8.6.4.4; SGN-PI-1027 indicated less than 900 psia with a steam header pressure of approximately 1140 psia. The range of the pressure indicator is 900 to 1300 psia. An initial investigation indicated the signal loop had failed downscale. Alternate indication was used and testing continued. The problem was determined to be a broken sensing line which was repaired under WO-15137. Therefore, this TER is closed and requires no retest.

TER 10: Steps 8.1.2.1, 8.1.2.1.1, 8.1.2.1.2, 8.1.2.1.3, 8.1.2.1.4, 8.1.2.2, 8.1.2.3, 8.1.2.4; this TER was generated during the results review process. The above referenced steps were not signed off during the hot steam flushes through the SG-UV-180 line. The hot steam flushes were performed for equipment protection only and therefore do not have an acceptance criteria. The intent of the steps is to open SG-UV-180 for the associated steam flush. Upon investigation it was determined that Step 8.2.2.1.11 of 91HF-1SF03 verified SG-UV-180 was indeed open during the steam flush. Therefore, this TER is closed and requires no retest.

TER 11: Steps 8.1.2.7, 8.1.2.8; this TER was generated during the results review process. The above referenced steps were not signed off during the hot steam flushes through the SG-UV-180 line. The hot steam flushes were performed for equipment protection only and therefore do not have an acceptance criteria. The intent of the steps is to close SG-UV-180 following the associated steam flushes in preparation for the next steam line flush. Upon investigation it was determined that Step 8.2.4.1.13 of 91HF-1SF03 verified SG-UV-180 was indeed closed following the steam line flush. Therefore, this TER is closed and requires no retest.

TER 12: Steps 8.1.3.7, 8.1.3.8; this TER was generated during the results review process. The above referenced steps were not signed off during the hot steam flushes through the SG-UV-171 line. The hot steam flushes were performed for equipment protection only and therefore do not have an acceptance criteria. The intent of the steps is to close SG-UV-171 following the associated steam line flush in preparation for the next steam line flush. Upon investigation it was determined that due to testing "work arounds" SG-UV-171 was the last MSIV flushed through instead of SG-UV-181. Therefore, due to the out-of-sequence testing it was not necessary to close SG-UV-171 i.e. Step 8.1.5 which required all MSIV's to be open applied to SG-UV-171 instead of SG-UV-181. This TER is closed and requires no retest.

TER 13: Steps 8.9.6.19 through 8.9.6.33 inclusive; these steps were signed off in the TER 02 retest. It was resolved by using the TER 02 retest as the verification of the steps. Therefore, this TER is closed and requires no retest.

F. CONCLUSIONS

With the retest exceptions noted under Recommendations the four MSIV's (SG-UV-170, 171, 180 and 181), two MSIV Bypass Valves (SG-UV-169 and 183), and six Steam Trap Valves (SG-UV-1133, 1134, 1135A, 1135B, 1136A and 1136B) met their acceptance criteria of this Precore HFT Test. These valves by meeting their acceptance criteria have demonstrated they are capable of fulfilling their safety related functions. See Section 3.2 of this procedure for the licensing commitment references.

G. RECOMMENDATIONS

1) Additional Testing:

a) Perform retest per TER 04. This will require stroking MSIV SG-UV-170 hot to observe the operation of the related "B" Train logic circuit for the SESS panel. This retest should be performed during Post Core HFT or when conditions permit.

b) Perform retest per TER 05. This will require stroking MSIV SG-UV-180 hot to observe the operation of the related "A" Train logic circuit for the SESS panel. This retest should be performed during Post Core HFT or when conditions permit.

c) Perform retest per TER 06. This will require stroking MSIV SG-UV-180 hot to observe the operation of the related "B" Train logic circuit for the SESS panel. This retest should be performed during Post Core HFT or when conditions permit.

d) Perform retest per TER 08. This will require exercising MSIV SG-UV-180 hot approximately 10% to verify the operation of the "B" Train Excercise Mode (acceptance criteria 2.1.2.2). This retest should be performed during Post Core HFT or when conditions permit.

e) A review of the 90HF-1ZZ01, Precore Hot Functional Testing Controlling Document, test log revealed that between May 13, 1983 and July 1, 1983 there were approximately 46 log entries (27 during June) that describe problems encountered with or operational concerns about the MSIV's. Two of the log entries documented requests made by the NRC for a demonstration of the operability of the MSIV's following repairs. Consequently, even though all but one of the acceptance criteria for this test were met it would prudent to reverify the operability of all four MSIV's during Post Core HFT or when conditions permit.

2) Test Techniques:

a) Incorporate TCN's 01, 03, 04, 05, 06, 07, 08 (modified by TCN 10), 09, 10, 11, 12, 13, 14 and 15 intc the test procedure.

b) To reduce confusion and the possibility of errors, the hot steam flushes should be consolidated into either this procedure or 91HF-1SG03, Precore Turbine Bypass Control System.

c) The Data Acquisition and Retrieval Terminal (DART), if available, HEATUP program should be used during the preliminary hot steam flushes through the MSIV's. Pertinent plant parameters for plant monitoring and historical records should be simultaneously recorded using the DATA TREND option of the HEATUP program. The suggested frequency is 1 calculation per minute during cooldowns and 1 calculation per 10 minutes during the recovery heatup.

3) Further Use of Test:

The MSIS response time and exercise mode test sections should be extracted, with the TCN's incorporated, and used as a basis for the required surveillance procedures.

4) Acceptance of Test:

The Test Results Reviewer recommends that TWG approve the test results on the basis that all acceptance criteria were met except the acceptance criteria associated with TER 08 and this has been identified for retest during Post Core HFT.

E.T. Childress, Jr.
APS Hot Functional Startup Engineer, Level III

APPENDIX A
ACCEPTANCE CRITERIA CROSS REFERENCE

ACCEPTANCE CRITERIA	SG-UV-170	SG-UV-171	SG-UV-180	SG-UV-181	SG-UV-169	SG-UV-183
Manual Slow Op. "A" Train	2.1.1.1 Pass	2.3.1.1 Pass	2.2.1.1 Pass	2.4.1.1 Pass	2.6.1 Pass	2.7.1 Pass
Exercise Mode "A" Train	2.1.1.2 Pass	2.3.1.2 Pass	2.2.1.2 Pass	2.4.1.2 Pass	N/A N/A	N/A N/A
Manual Slow Op. "B" Train	2.1.2.1 Pass	2.3.2.1 Pass	2.2.2.1 Pass	2.4.2.1 Pass	2.6.2 Pass	2.7.2 Pass
Exercise Mode "B" Train	2.1.2.2 TER 08	2.3.2.2 Pass	2.2.2.2 Pass	2.4.2.2 Pass	N/A N/A	N/A N/A
Fast Close Op. "A" Train	2.5.1.1 Pass	2.5.3.1 Pass	2.5.1.1 Pass	2.5.3.1 Pass	N/A N/A	N/A N/A
Fast Open Op. "A" Train	2.5.1.2 TCN 13	2.5.3.2 TCN 13	2.5.1.3 TCN 13	2.5.3.3 TCN 13	N/A N/A	N/A N/A
Fast Close Op. "B" Train	2.5.2.1 Pass	2.5.4.1 Pass	2.5.2.1 Pass	2.5.4.1 Pass	N/A N/A	N/A N/A
Fast Open Op. "B" Train	2.5.2.2 TCN 13	2.5.4.2 TCN 13	2.5.2.3 TCN 13	2.5.4.3 TCN 13	N/A N/A	N/A N/A
MSIS Response Time "A" Train ($\leq$ 5 sec.)	2.8.1.1 3.12 sec.	2.8.3.1 3.04 sec.	2.8.2.1 3.08 sec.	2.8.4.1 3.24 sec.	2.8.5.1 3.5 sec.	2.8.6.1 4.0 sec.
MSIS Override Op. "A" Train	2.8.1.2 Pass	2.8.3.2 Pass	2.8.2.2 Pass	2.8.4.2 Pass	2.8.5.2 Pass	2.8.6.2 Pass
MSIS Response Time "B" Train ($\leq$ 5 sec.)	2.8.1.3 3.2 sec.	2.8.3.3 3.0 sec.	2.8.2.3 3.06 sec.	2.8.4.3 3.16 sec.	2.8.5.3 4.6 sec.	2.8.6.3 4.08 sec.
MSIS Override Op. "B" Train	2.8.1.4 Pass	2.8.3.4 Pass	2.8.2.4 Pass	2.8.4.4 Pass	2.8.5.4 Pass	2.8.6.4 Pass
Loss of Power Response	2.9 Pass	2.9 Pass	2.9 Pass	2.9 Pass	2.9 Pass	2.9 Pass

ACCEPTANCE CRITERIA	SG-UV-1333	SG-UV-1134	SG-UV-1135A	SG-UV-1135B	SG-UV-1136A	SG-UV-1136B
MSIS Response Time ($\leq$ 5 sec.)	2.10 0.15 sec.	2.10 0.25 sec.	2.10 0.66 sec.	2.10 0.26 sec.	2.10 0.41 sec.	2.10 0.14 sec.
Loss of Power Response	2.9 Pass	2.9 Pass	2.9 Pass	2.9 Pass	2.9 Pass	2.9 Pass