Validation/Field Installation Verification

Test Report

For

Nebraska Public Power District

Plant Management Information System

A. F. Lexa
N. C. Thomas
B. D. Paul
J. H. McCleskey

SAIC-86/1500&264&0
March 12, 1986

Science Applications International Corporation
Post Office Box 4406, Lynchburg, Virginia 24502

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RECORD OF REVISIONS

Date	Revision Number	Revision
3/12/86	0	Original Issue of Report

PAGE COUNT SUMMARY

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1.0 INTRODUCTION

This document is the Nebraska Public Power District (NPPD) Validation/Field Installation Verification Test Report. The purpose of this report is to describe the validation and field installation verification process applied to the NPPD Plant Management Information System (PMIS) and to present the results. The validation/field installation verification accomplished the major goals identified in the V&V Plan and V&V Procedures, (references 2 and 3). Figure 1-1 indicates how the activities described in this report fit into the overall V&V effort.

Specific topics addressed in this document are:

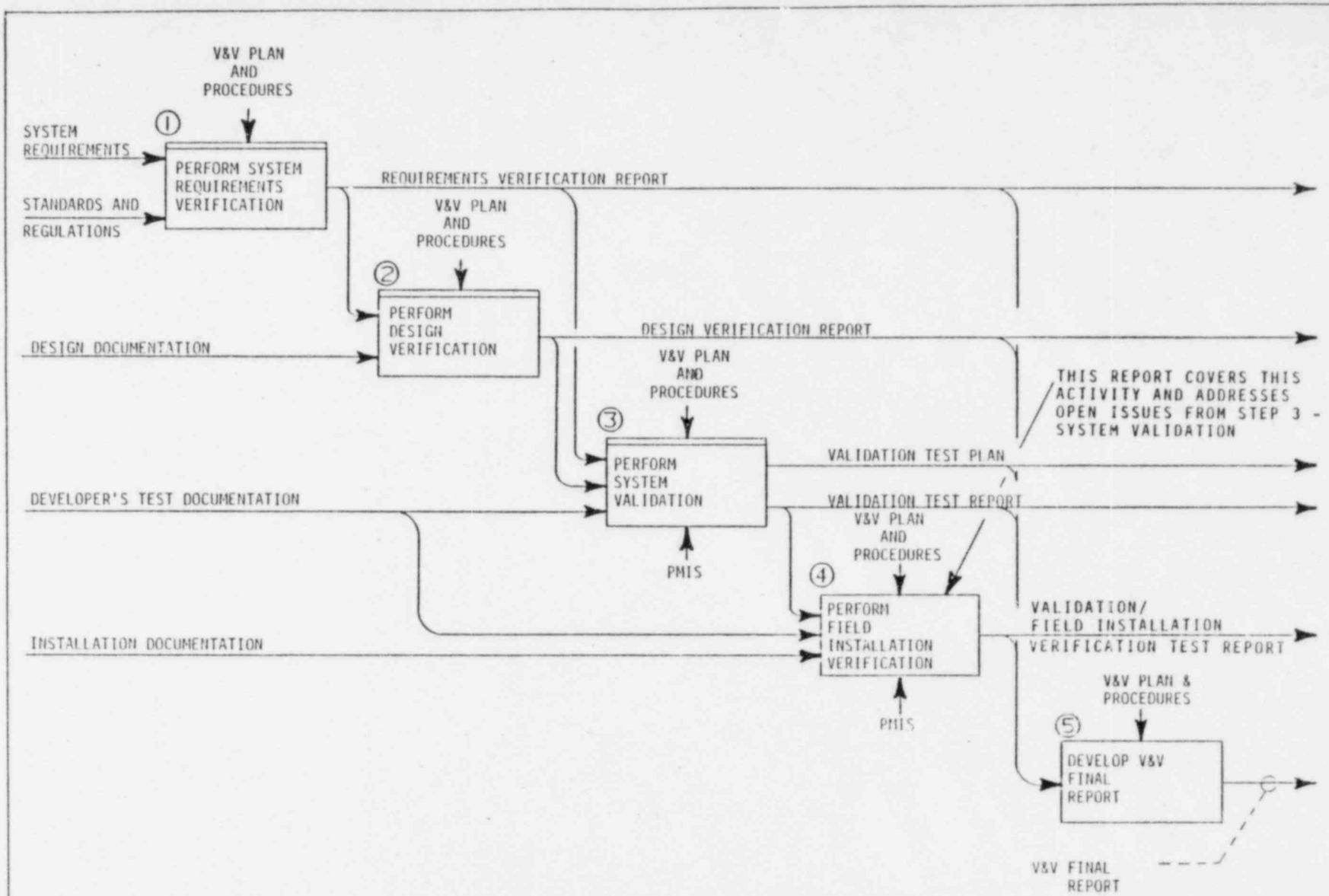
- Description of the validation activities begun during factory acceptance testing (FAT) and continued through site acceptance testing (SAT). Section 2.0

- Description of the field installation activities. Section 3.0.

- Summary of results and recommendations. Section 4.0.

- Detailed listings of validation test log, reviewer comments and discrepancy reports. Appendices A through C.

The results of the validation and field installation verification indicate that the PMIS has been adequately tested except for the two areas described in the discrepancy reports. In addition, the V&V Team recommends that the open reviewer comments be considered for further review and/or system enhancement. It is also noted that the completion of the 1,000 hour test and the study comparing SPDS displays to control room displays will further confirm the conformance of the PMIS to the system requirements and the accuracy of the SPDS displays.



SCOPE OF THIS V&V REPORT

FIGURE 1-1

The validation and field verification of the NSSS software and special function software will be covered in a separate report.

1.1 Team Organization

The V&V Team members who participated in the preparation of this document were:

A. F. Lexa	SAIC-Lynchburg
J. H. McCleskey	PPE-Idaho Falls
B. D. Paul	SAIC-Lynchburg
N. C. Thomas	SAIC-Lynchburg

The lead V&V Team consisted of members from the SAIC office in Lynchburg.

J. H. McCleskey of PPE was subcontracted by NPPD to provide V&V support.

Independence of the V&V Team was maintained at all times. The SAIC V&V Team performed validation/field installation verification through documented communication. Mr. McCleskey operated independently as part of the V&V Team and reported only administratively to Mr. J. C. Murphy (NPPD Project Manager).

Figure 1-2 shows the V&V Team and Design Team organization during system validation.

1.2 Summary of Validation/Field Verification Activities

The V&V activities described in this report basically pickup where the validation testing at the factory stops. The validation test report (reference 8) summarizes the test methodology and testing performed on the PMIS at the factory. Following these tests there were a number of unresolved areas concerning the system test and test methodology. These are summarized in the discrepancy reports and reviewer comments in reference 8. Because these issues were not resolved prior to the beginning of the site acceptance testing, the validation concerns were addressed during site acceptance testing as well as the field installation verification activities. In a joint effort between SAIC-Lynchburg and PPE (McCleskey) the following activities were performed.

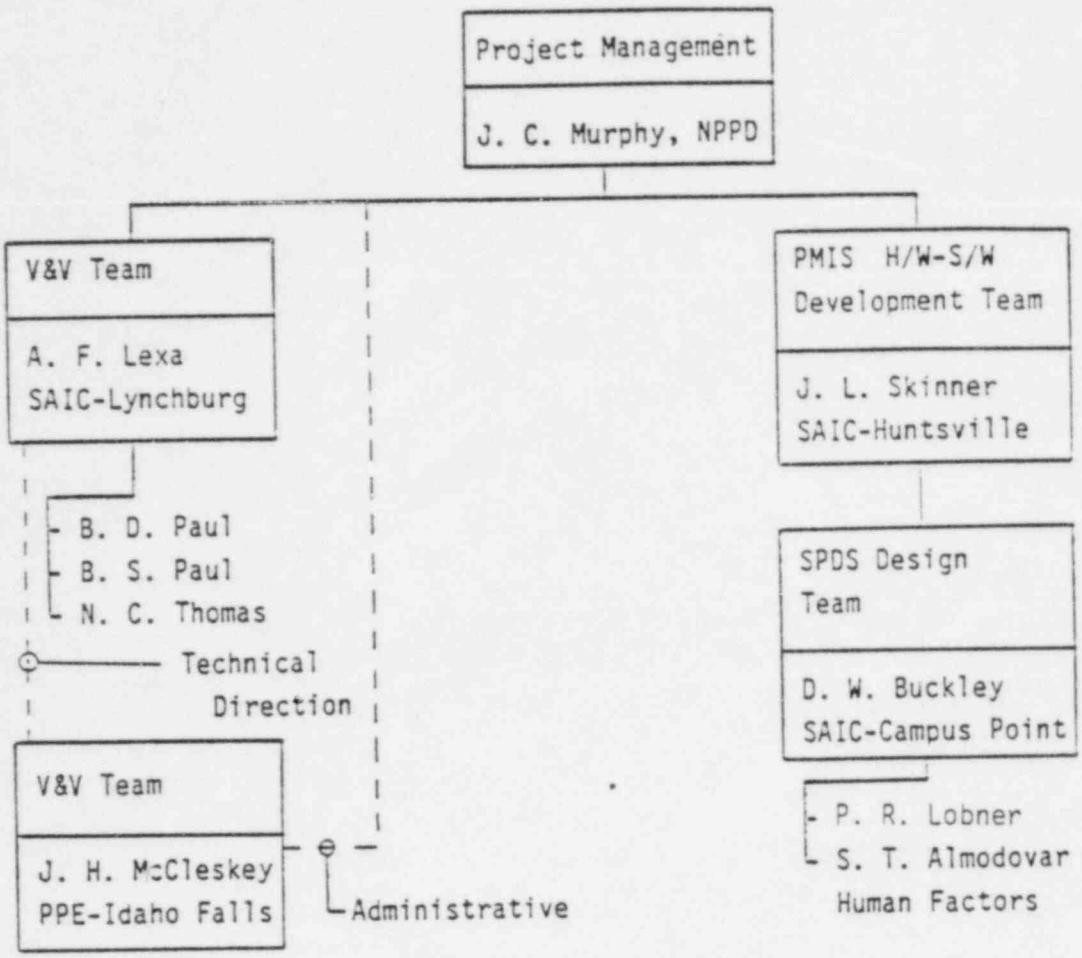


Figure 1-2
V&V Team & Development Organization

- The SAT tests results (primarily a subset of the FAT tests) were analyzed by the V&V Team. In some cases the site testing resolved concerns established during factory testing.

- At Cooper Nuclear Station (CNS), the V&V Team observed testing, interviewed responsible NPPD individuals and examined a test documentation to establish installation tests and problem reporting and resolution techniques.

- The V&V Team conducted tests at CNS, especially in the areas of the SPDS, to establish system performance and conformance to design documentation.

- The V&V activity was documented in test logs and reported problems in either reviewer comment, discrepancy report, or site problem report forms.

- All open problems were presented to the developers for resolution. The final set of open issues are presented in this report.

1.3 Deviations to V&V Plan and Procedures

The V&V Plan and V&V Procedures (references 2 and 3) describe the activities for the field installation verification. The activities actually performed by the V&V Team deviated somewhat from the field installation verification as described in references 2 and 3. There are two primary reasons for this deviation: a) continuation of validation into site acceptance testing and b) nature of the PMIS front-end and the extensive testing performed by NPPD. As stated above, this report addresses and completes the validation activities which were started during factory acceptance testing (FAT). The original V&V Plan had assumed that the majority of problems found during FAT would be resolved prior to starting the site acceptance testing (SAT). If this would have occurred it would only have left the verification activity that the validated system was properly installed at the site. In reality, this was not the case and the conclusion of validation and installation verification had to be completed in parallel at the site.

Confirmation of correct installation of the field wiring to the PMIS system was essentially performed by the thorough NPPD testing of the CPI equipment. A V&V Team review of this test and test data indicate that no further V&V testing was necessary in this area. Also, NPPD committed to performing a comparison of SPDS display data to the main control board displays. The NPPD front-end testing and SPDS comparison performed by NPPD enhanced the witnessing of developers tests for field installation verification.

Because of these differences, the V&V Team concentrated on resolving the open areas of concern resulting from validation during FAT by close examination of SAT tests. This effort was documented primarily through discrepancy reports and reviewer comments.

1.4 References

1. Nebraska Power District Plant Management Information System Cooper Nuclear Station Statement of Work, SAIC Document 1-323-05-766-00. (Published by Development Team, Huntsville.) (The agreement between NPPD and SAIC was signed on November 2, 1983.)

   a. Volume I and II, Rev. 0, dated October 7, 1983
   b. Volume I, Rev. 1, dated January 16, 1985

2. Verification and Validation Plan, Rev. 0, SAIC Document 503-8500000-51, dated March 1, 1984. (Published by V&V Team, Lynchburg.)

3. Verification and Validation Procedures for Nebraska Public Power District Cooper Nuclear Station Plant Management Information System, Revision 1, SAIC document SAIC-85/1024-264-1, dated July 11, 1984. (Published by V&V Team, Lynchburg.)

4. Nebraska Public Power District Plant Management Information System Cooper Nuclear Station Functional Specification - Rev. A, SAIC Document 501-8500109-26, dated September 26, 1984. (Published by Development Team, Huntsville.)

   a. Rev. A, dated September 26, 1984
   b. Rev. B, dated June 6, 1985

5. Nebraska Public Power District Plant Management Information System Detailed Descriptions of the Displays for the Cooper Nuclear Station Safety Parameter Display System, SAIC Document 503-8500000-78. (Published by Development Team, Campus Point.)

   a. Draft, dated April 20, 1984
   b. Dated July 20, 1984
   c. Draft dated January 4, 1985
   d. Revision 2 dated February 1, 1985
   e. Revision 3 dated February 3, 1986

6. Nebraska Public Power District Plant Management Information System Cooper Nuclear Station Test Plan, SAIC document 501-8500102-01. (Published by Development Team, Huntsville.)

   a. Preliminary dated March 7, 1984
   b. Draft dated April 16, 1984
   c. Draft dated October 26, 1984

7. Nebraska Public Power District Plant Management Information System Cooper Nuclear Station Nebraska Test Procedures, Document No. 501-8500102-02. (Published by Development Team, Huntsville.)

   a. December 18, 1984
   b. January 7, 1985
   c. Procedure received at FAT
   d. Procedure received with SAIC memo Pate to Lexa, dated 3/21/85
   e. Revision A Final, March 25, 1985

8. Validation Test Report for Nebraska Public Power District Plant Management Information System, Document No. SAIC-85/1692&264. (Published by V&V Team, Lynchburg.)

   a. May 8, 1985 - Draft Issued, SAIC Letter NPPD-264-031
   b. July 26, 1985 - Revision 0 Issued, SAIC Letter NPPD-264-85-44
   c. August 7, 1985 - Revision 1 Issued, SAIC Letter NPPD-264-85-047

9. SAIC Letter, A. F. Lexa to James Murphy, dated 8/1/85, letter number NPPD-264-85-046, Validation/Field Verification, V&V Team at CNS.

10. SAIC Memo, Skinner to Lexa, dated 8/16/85, Site Test Procedures and Data.

11. Record of Telephone Documentation to D. C. Baker, D. G. Golino (Burns & Roe) from A. F. Lexa (SAIC-Lynchburg), dated 8/26/85, PMIS 1E Isolation Questions.

12. SAIC Letter A. F. Lexa to James Murphy, dated 8/26/85, letter number NPPD-264-85-048, Request for PPE Review of Site Acceptance Test (SAI) Data.

13. PPE Letter J. H. McCleskey to A. F. Lexa, dated 9/16/85, V&V CNS Site Visit Documentation.

14. SAIC Letter A. F. Lexa to James Murphy dated 9/20/85, Letter No. NPPD-264-85-050, Preliminary Information From Field Validation.

15. SAIC Memo Skinner to Lexa, dated 10/1/85, Response to DR # 4.

16. PPE Letter McCleskey to Lexa, dated 10/2/85, Review of SAI Test Data.

17. PPE Letter McCleskey to Murphy, dated 10/20/85, PPE SPDS Testing at CNS 10/3, 4/85.

18. NPPD Letter J. C. Murphy to J. L. Skinner, dated 10/21/85, Drywell (D/W) Temperature Points for SPDS Displays.

19. SAIC Memorandum Pete Lobner to Distribution, dated 11/7/85, Summary of SPDS Status Meeting at Cooper Nuclear Station.

20. PPE Letter McCleskey to Murphy, dated 11/10/85, Summary of Discussions With Pete Lobner at CNS.

21. NPPD Letter J. C. Murphy to J. L. Skinner, dated 11/25/85, Final Changes to SPDS Code and Documentation Prior to Availability Test.

22. PPE Letter J. H. McCleskey to A. F. Lexa, dated 11/27/85, Review of Station Problem Reports.

23. PPE Letter J. H. McCleskey to A. F. Lexa, dated 11/30/85, Transmittal of Letters Sent to Jim Murphy Covering Various Subjects.

24. NPPD Letter Michael Culjat to A. F. Lexa, dated 12/30/85, Status of PMIS Error Reports, Change Requests, etc.

25. SAIC Memo A. F. Lexa to J. L. Skinner, dated 1/9/86, Final Reviewer Comments (RC's) and Discrepancy Reports (DR's) From Validation and Field Verification Request For Resolution.

26. SAIC Memo J. L. Skinner to A. F. Lexa, dated 1/29/86, NPPD Discrepancy Reports.

27. NPPD Record of Telephone Conversation, B. D. Paul to M. P. Honke, dated 2/20/86, Comments on Response to Discrepancy Report 2.

1.5 List of Abbreviations

A/D	Analog to Digital
CCB	Configuration Control Board
CDR	Critical Design Review
CNS	Cooper Nuclear Station
CPI	Computer Products, Inc. - Data Acquisition System
CPU	Central Processing Unit
CRDR	Control Room Design Review
CRT	Cathode Ray Tube
CVT	Current Value Table
DAS	Data Acquisition System
DR	Discrepancy Report
EOF	Emergency Offsite Facility
ERF	Emergency Response Facilities
ERFIS	Emergency Response Facilities Information System
FAT	Factory Acceptance Test
FMEA	Failure Modes Effects and Analysis
F-SPEC	Functional Specification (Reference 4)
IRCU	Intelligent Remote Control Unit
HPR	Hardware Problem Report
HW	Hardware
NPPD	Nebraska Public Power District

NRC	Nuclear Regulatory Commission
NSAC	Nuclear Safety Analysis Center
NSSS	Nuclear Steam Supply System
OR	Originating Requirement
PDR	Preliminary Design Review
PPE	Pied Piper Engineering (J. H. McCleskey)
PMIS	Plant Management Information System
QA	Quality Assurance
RC	Reviewer Comment
RPIS	Rod Position Information System
RWM	Rod Worth Minimizer
SAI	Science Applications, Incorporated
SAIC	Science Applications International Corporation (Previous name SAI)
SAIPMS	Science Applications, Incorporated Plant Monitoring System
SAT	Site Acceptance Test
SDBC	Site Data Base Change (Request)
SDCR	Site Data Change Request
SER	Software Error Report
SHPR	Site Hardware Problem Report
SOE	Sequence of Events
SOW	Statement of Work (System Requirements Document)
SPDS	Safety Parameters Display System
SR	System Requirement
SSCR	Site Software Change Request
SSER	Site Software Error Reports
SSMR	Site Software Move Request
STVR	Site Test Variance Report
SW	Software
TC	Thermocouple
TIP	Traversing Incore Probe
TSC	Technical Support Center
TVR	Test Variance Report
V&V	Verification and Validation
VVID	Verification and Validation Interactive Description

2.0 CONTINUED VALIDATION ACTIVITIES

2.1 Status of Validation After Factory Acceptance Testing

At the conclusion of the PMIS factory acceptance testing (FAT), the V&V Team could not completely demonstrate that adequate testing was performed at the FAT. Additional testing was recommended. These conclusions and documentation are contained in the Validation Test Report (Reference 8). Revision 1 of the Validation Test Report issued in August 7, 1985 contained twenty-one open Reviewer Comments and four open Discrepancy Reports.

The V&V Plan assumed that the majority of V&V identified problems would be resolved after Factory Acceptance Testing, but before installation and Site Acceptance Testing. However, the actual PMIS schedule resulted in the installation of the system at Cooper Nuclear Station immediately following the Factory Testing. Because of this, the V&V Team needed to continue the definition and resolution of the Validation Reviewer Comments and Discrepancies as part of site acceptance testing.

2.2 Site Acceptance Tests

The Developers conducted site acceptance testing (SAT) primarily as a subset of the factory acceptance tests. Some special tests were developed and as problems were documented by NPPD personnel, other tests were conducted to resolve problems. Reference 10 provided the V&V Team with all the site test procedures, test results and site problem reports through July 26, 1985. Reference 16 is a summary of the V&V Team review of these test procedures and results. This review indicated that some of the open Discrepancy Reports and Reviewer Comments could be closed, but the majority remained open.

In addition to review of the SAT test data, the V&V Team visited Cooper Nuclear Station and observed site testing and conducted some V&V tests. V&V site activities are recorded in the test log and letters enclosed in Appendix A. The on-site review by the V&V Team permitted resolution of some areas of concern and caused new areas to be reported. It is noted that the V&V Team did not feel it necessary to develop a parallel problem reporting system. Where a problem was identified by the site problem report form the

V&V Team did not issue a parallel Reviewer Comment or Discrepancy. In some instances where the V&V Team, in cooperation with the NPPD personnel, identified a problem the NPPD problem reporting system was used. In other cases where the V&V Team identified a problem independent of the NPPD personnel, a Reviewer Comment or Discrepancy was prepared.

As the installation and testing process of the PMIS continued, the identified problems were addressed and resolved by the Developers. In addition, the Developers responded to specific V&V concerns in References 15, 19 and 26. These responses along with the closeout of the site problem reports resolved most of the open Reviewer Comments and Discrepancies. Attachment B is a summary of all the Reviewer Comments and Discrepancies which were formulated as part of Factory and Site Acceptance testing. The summary shows the current status of the Reviewer Comments and Discrepancy Reports. Currently, there are two of five Discrepancy Reports that remain open and fourteen of twenty-six Reviewer Comments.

2.3 V&V Team Concentration On The SPDS

Due to the importance of the SPDS displays, the V&V Team concentrated its review on the SPDS and PMIS system interface. The V&V Team SPDS testing consisted of observing the SPDS displays for correctness and response time based on live plant data. A number of areas of concern were uncovered and identified to the Developers. References 17, 19, 20 and 21 discuss the problems uncovered and the resolution. The V&V Team considers that the SPDS problems have either been resolved or they have been adequately documented by NPPD and are currently undergoing resolution. In summary, the V&V Team has identified no major problems with the SPDS.

3.0 FIELD INSTALLATION VERIFICATION

3.1 Running Of Selected Factory Acceptance Tests At The Site

An important objective of Field Installation Verification is to ensure that the system as tested and documented at the factory is correctly installed at the site. This activity was performed by the developers conducting site tests, which were basically a subset of factory tests. These tests and test data are contained in Reference (10). The V&V Team reviewed this test data and documented the review in Reference (16). Although some problems surfaced during this testing, the basic objective, to ensure correct installation of the system, was accomplished.

3.2 Field Wiring To PMIS Loop Tests

Another important objective of Field Installation Verification is to ensure that the field wiring is correctly terminated to the PMIS. During a V&V Team visit to CNS on August 21, 1985 NPPD personnel described the loop tests performed under minor design change 84-37D, E and F. These tests consisted of a 100 percent testing of all inputs from the field wiring to the CPI front end. For each signal, a test loop current was injected and the corresponding correct output downstream of the multiplexer was verified at at least two points on the instrument span. The description of these tests is documented in the test logs in Appendix A and was forwarded to NPPD via Reference 14. In addition, in a SAIC letter from Buck to Murphy dated 7/23/85 the Developers concurred with the validity of the NPPD front end tests. From this information, the V&V Team considered that the front end was adequately tested and that no additional V&V tests were required in this area.

3.3 Comparison Of Existing Control Room Indications With SPDS Displays

In addition to the Field Installation Verification tests described above, NPPD personnel will perform a comparison of existing control room displays with the SPDS displays. This comparison, which is recommended by the V&V Team, will further help to ensure accuracy in the field installation and

data base configuration of the PMIS. At the time of preparation of this report, NPPD had not completed this activity but has committed to perform the comparison as documented in the test logs contained in Appendix A and in Reference 22.

4.0 CONCLUSIONS AND RECOMMENDATIONS

As a result of the Validation and Field Installation Verification performed during testing at the factory and at Cooper Nuclear Station, the V&V Team considers the PMIS acceptably tested except for the two areas covered by Discrepancy Reports 2 and 5. The SPDS portion of the PMIS has been thoroughly tested by both the Developers and the V&V Team and is considered satisfactory.

The two open Discrepancy Reports are fully documented in Appendix C and are briefly summarized here.

- Discrepancy Report No. 2 - Data Acquisition System:

  The V&V Team has identified a number of data acquisition system capabilities which have not been formally tested. It is recommended that these capabilities be formally tested, or if they are not necessary for this system, that the requirements be waived.

- Discrepancy Report No. 5 - System Load Test:

  Although a simulated load test was performed at the factory, the V&V Team considers that a self-monitoring type of test be conducted on the PMIS to measure the system performance in its final installed configuration. Since the primary mission of the SPDS portion of the system is to aid operating personnel during transient and emergency type operations, the V&V Team considers that some system performance measurements should be obtained to confirm that the system will provide the necessary speed and throughput during plant upset conditions.

The Reviewer Comments listed in Appendix D are of a less serious nature than Discrepancy Reports and are offered as suggestions to NPPD and the Developers. The remaining open Reviewer Comments can be grouped into the following categories:

- Reviewer Comments 2, 5, 6, 8, 23, 24, 25 and 26 - SPDS Human Factors Concerns. These Reviewer Comments consist of the V&V Team's technical opinion as to possible improvements or human factor concerns on the SPDS displays. It is recommended that NPPD or the Developers use these recommendations during future enhancements of the displays.

- Reviewer Comment 21 - System Health Monitor. During V&V testing it was noted in a number of instances where it was difficult to determine whether the SPDS was operating or not. The V&V Team recommends that some form of display be provided to the operator so that the operability of the SPDS can be checked very simply and quickly.

- Reviewer Comments 13, 14, 18 and 19. These pertain to relatively minor PMIS capabilities for which no formal testing could be found by the V&V Team. The V&V Team recommends that if these capabilities are important to the PMIS function some formal tests should be conducted.

- Reviewer Comment 1 - Scenario File Control. This Reviewer Comment is a documentation concern generated during the factory acceptance testing. The main thrust of this Reviewer Comment was to ensure that the test scenario files used during factory testing were documented so that reproducible tests could be performed at the site. If NPPD considers the site and the factory test package documented adequately, then this is a moot point.

APPENDIX A

V&V TEAM TEST LOG AND CORRESPONDENCE

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 8/20/85	LOCATION: CNS	SEQUENTIAL PAGE NO.: 1

TEST PROCEDURE NO.: N/A

TEST PROCEDURE TITLE: N/A

DESCRIPTION OF TEST: N/A

COMMENTS/OBSERVATIONS:

- McCleskey went through CNS training on 8/19 and was badged on 8/20/85.

- Lexa arrived on 8/20/85 a.m.

- The first of the five Monicore parallel tests had been completed however the remaining four could not be run because the plant was not at a sufficient power level.

- The day was spent by Lexa and McCleskey reviewing the open reviewer comments and discrepancy reports with Leo Parks and Mike Culjat. The purpose of this discussion was to determine if there were any tests and test data that would resolve open V&V concerns. All open discrepancies and reviewer comments from requirements verification and validation were discussed. The following summarizes those areas where Parks or Culjat had input:

Requirements Verification

DR # 2 - SPDS-Control Room Display consistency. Mike Culjat stated that this test program is scheduled to be done.

DR # 3 - Health Monitor. The concensus was that a simple effective means to determine system health could be desirable. This also relates to Validation RC # 21.

REPORTED BY: A. F. Lexa

(V&V Team To Keep Original Sheets in 3-Ring Binder)

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 8/20/85	LOCATION: CNS	SEQUENTIAL PAGE NO.: 2

TEST PROCEDURE NO.: N/A

TEST PROCEDURE TITLE: N/A

DESCRIPTION OF TEST: N/A

COMMENTS/OBSERVATIONS:

Design Verification

DR # 12 - SPDS Human Factors Design. Neither the V&V Team nor Parks/Culjat had seen any evidence of human factors review for the SPDS design.

DR # 14 - SPDS Linkage. It was stated that additional work is required to determine the final SPDS display linkage. This also relates to Validation RC # 2.

DR # 18 - The question of termination of redundant 1E inputs was raised by Lexa. A discussion with Harlan Jantzen was recommended.

Validation

DR # 2 - Data Acquisition System. The data from the 10 pps test was reviewed. Parks pointed out the phenomenon where points were periodically not sampled. Parks noted that SCE's were tested at FAT in test 46, not 45.

DR # 5 - Load Test. A discussion followed on the current CPU utilization without the NSSS or BOP software. A rough estimate of CPU utilization was 60 to 80%. These values are questionable because there were controlled conditions. However, it was agreed that some form of log could be generated to track CPU utilization on a periodic basis. This would help identify the system loading under real plant conditions.

REPORTED BY: A. F. Lexa

(V&V Team To Keep Original Sheets in 3-Ring Binder)

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 8/20/85	LOCATION: CNS	SEQUENTIAL PAGE NO.: 3

TEST PROCEDURE NO.: N/A

TEST PROCEDURE TITLE: N/A

DESCRIPTION OF TEST: N/A

COMMENTS/OBSERVATIONS:

RC # 11 - Minute Scan Rate. Parks explained that there were no 15 minute scan points. The 15 min. scan class refers to the ability of the system to receive RAD/MET data incependent of the PMIS DAS.

RC # 13 - Running Average Calculation. After much discussion it was determined that more data was necessary to verify the running average transform.

RC # 9 - Security System. Although no formal tests have been conducted at CNS on the security system, Culjat said that daily challenges to the system indicate that the security system is working.

REPORTED BY: A. F. Lexa

(V&V Team To Keep Original Sheets in 3-Ring Binder)

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 8/21/85	LOCATION: CNS	SEQUENTIAL PAGE NO.: 4

TEST PROCEDURE NO.: N/A	TEST PROCEDURE TITLE: N/A

DESCRIPTION OF TEST: N/A

COMMENTS/OBSERVATIONS:

- The plant still was not at power to allow the parallel tests. Discussions continued.

- Lexa and McCleskey had a discussion with Harlan Jantzen.

  Summary follows.

  1. The 1E boundary for the 1E mux cabinets was explained by Jantzen as the fiber optic cable and the isolation transformer. With respect to the isolation of the input signals, it was explained that as long as the division 1 and 2 separation of AC power was maintained then the 1E separator requirements were met.

  2. The AC power system was discussed. The entire PMIS, including all remote muxes, were on the same power system. That power system is an UPS switchable to diesel power.

  3. Jantzen described the test program (loop tests) that NPPD performed to check that the field wiring was properly terminated to the multiplexes. This test program and results are documented in MDC 84-37 D, E & F (site documentation - minor design change). This test program consisted of:

     - 100% testing of all inputs
     - signal was generated by signal insertion at transmitter or by actual plant parameter purtabation
     - the signal was verified downstream of the multiplexer by inputting an address for a particular point

REPORTED BY: A. F. Lexa

(V&V Team To Keep Original Sheets in D-Ring Binder)

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 8/21/85	LOCATION: CNS	SEQUENTIAL PAGE NO.: 5

TEST PROCEDURE NO.: N/A

TEST PROCEDURE TITLE: N/A

DESCRIPTION OF TEST: N/A

COMMENTS/OBSERVATIONS:

- o a two point check, as a minimum, was performed by each check
- o some end to end tests were performed

SAIC letter Buck to Murphy, dated 7/23/85 described how the above loop tests and SAIC site tests would serve to fully ensure that the system was correctly installed.

- For the afternoon, the V&V Team stepped through each of the SPDS displays. A number of areas were checked based on open reviewer comments from factory tests. A copy of each of the SPDS displays was obtained. Since the plant was shutdown no at power displays could be obtained.

- Since the plant was not scheduled to reach the necessary power level for the parallel tests until the following week. The V&V team left the site.

REPORTED BY: A. F. Lexa

(V&V Team To Keep Original Sheets in D-Ring Binder)

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 08/29/85	LOCATION: CNS	SEQUENTIAL PAGE NO. 6

TEST PROCEDURE NO.: N/A

TEST PROCEDURE TITLE: N/A

DESCRIPTION OF TEST: N/A

COMMENTS /OBSERVATIONS:

- The Station is at 30% power, one out of four TIP machines is not operating. The detector has broken off from the wire drive.

- Discussed PMIS testing status with Peterson, Parks, Goebel, Vanderkamp, Massey, Borland, and Burgin.

The data concentrators have been acting up since monday. It appears that DEFRIENDZ is not talking to the data concentrators. PMIS gives the BOOM message. The DC's were down six times on the 27th and four times on the 28th. They have been down two times today. Skinner is trying to access the PMIS by modem from Huntsville. He is still the responsible party for the PMIS and is reluctant to come to CNS or to give someone at CNS the responsibility for the PMIS. During a Murphy/Peterson/Skinner phone conversation today the DC's were discussed along with the problem of an on site responsible SAIC person. During the phone call Parks got the modem working for skinner to access the PMIS. The site problem is that unless the PMIS is working for CPM testing prior to the plant reaching 100% power, test procedures will require rewriting. The opportunity to test the CPM software as the plant increases power may pass for this time period. The plant should be at full power in two weeks.

Additional problems have surfaced with the CPM software in the areas of poor signal definition from plant TIP data points and some toe stepping on between the CPM and other PMIS software. These problems can only be detected as the software package is being integrated at CNS with live plant data.

- Returned a call from Virgil Burrer (SAIC QC Huntsville) on plant and

REPORTED BY: J.H. McCleskey

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 08/29/85	LOCATION: CNS	SEQUENTIAL PAGE NO. 7

TEST PROCEDURE NO.:	TEST PROCEDURE TITLE:
N/A	N/A

DESCRIPTION OF TEST:

N/A

COMMENTS /OBSERVATIONS:

PMIS testing status.

- Called Tony Lexa to discuss PMIS testing Status. Lexa requested that I look into several items;

  1. Reactor Period - Manually insert a point for SPDS0014 and observe the SPDS period display, Also check the scan frequency for poing SPDS0087. Is it one second? See paragraph 8.1.3 in the SPDS Description Document.
  2. Get Leo Parks to run TEST44 and evaluate the results.
  3. Have Leo Parks assign a point ID to the 15 minute Scan Frequency.
  4. Perform more of the SPDS display call up time trials. Look for the 3 second limit specified in the SOW.
  5. Look into testing the SPDS Point ID transition from Healthy to Unhealty.
  6. Write up activitees each day and keep in touch with Lynchburg.

- Strickland (from Huntsville) provided a software command to keep the DC's online. The VAX will now continue to try to access the DC's with out stopping, which before would give a DC's down indication.

- Stopped by the station about 20:00 hours and talked with Borland and Bergin. No CPM testing is scheduled tonight.

REPORTED BY:

J.H. McCleskey

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 08/30/85	LOCATION: CMS	SEQUENTIAL PAGE NO. 8

TEST PROCEDURE NO.:	TEST PROCEDURE TITLE:
N/A	N/A

DESCRIPTION OF TEST:

N/A

COMMENTS /OBSERVATIONS:

- Reviewed the five CPM Parallel tests. Test 2 has been run and data collected. The TIP data was not included with test 2. TIP data will be collected in Test 4.

- Discussed TEST 44 with LeoParks. He will run when he has time.

- Bergin and Massey will work through Saturday. Uncertain as to CPM testing. Some trouble getting TIP data by the CPM software. TIP signal data being monitored by the PMIS was not described correctly prior to site testing.

- The failed TIP machine has been replaced and is being tested by station personnel.

- Called Lexa, gave me his home phone number and said he will be back in the office nextWednesday. Discussed my progress with previous days assignments.

- The PMIS harécopy machine is out of order during the TSC enlargement.

- Began review of SPDS displays with the plant at 30% power. Specifically looking for display data that I think is incorrect for this level of plant operation. I am Also checking the SPDS display data logic against the SPDS Displat Detailed Description Document, 503-8500000-78 (Rev. 2). See attached SPDS DISPLAY REVIEW notes for results of observation and analysis.

- During the SPDS Display Review, the PMIS locked up. It is interesting to note that even though Man-Machine appeared to be stopped and the

REPORTED BY:
J.H. McCleskey

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 08/30/85	LOCATION: CMS	SEQUENTIAL PAGE NO. 9

TEST PROCEDURE NO.:	TEST PROCEDURE TITLE:
N/A	N/A

DESCRIPTION OF TEST:

N/A

COMMENTS /OBSERVATIONS:

time on the IDT was stopped, However, the SPDS displays appeared to perform as designed. This included screen data update and being able to switch from SPDS display to SPDS display. The IDT would lock up if you requested any other softwere subset, such as NSSS. A phone call to Skinner and Strickland corrected the lockup, which apparently had something to do with running the CPM software and a XOFF condition on IDT 06.

- One other observation was that on the PMIS Performance Monitor display the indication for both Data Concentratprs was a red DOWN. This lasted all afternoon.

- Stopped by the station around 19:00 to check status of CPM software. Talked with Burgin and Massey, still not able to access the TIP power level signal. No testing scheduled for tonight.

REPORTED BY: J.H. McCleskey

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 08/31/85	LOCATION: CNS	SEQUENTIAL PAGE NO. 10

TEST PROCEDURE NO.: N/A

TEST PROCEDURE TITLE: N/A

DESCRIPTION OF TEST:

N/A

COMMENTS /OBSERVATIONS:

- The PMIS was down about 10:00. After performing a reboot the front end was not running. The IDT's indicate 29-AUG-1985, 01:11:54. Both DAFRENDZ AND DAPPARCA Are down.

- Discussed the PMIS status with Bergin and Peterson. After talking to Culjat and Delsing, Burgin copied the DEFRENDIZ.EXE file to a DEFRENDZ.EXE file. After rebuilding the system the IDT's now update time and date correctly.

- Peterson requested a TIP run. We observed on a PMIS display the flux profile from the tip going into the core and out of the core.

- System operational status is questionable. Burgin and Peterson question continuing with NSSS work until the PMIS is brought to an operatioaal status by Skinner.

REPORTED BY: J.H. McCleskey

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 09/03/85	LOCATION: CNS	SEQUENTIAL PAGE NO. 11

TEST PROCEDURE NO.:	TEST PROCEDURE TITLE:
N/A	N/A

DESCRIPTION OF TEST:

N/A

COMMENTS /OBSERVATIONS:

- PMIS was down this morning, IDT's indicated 10:05:40. DEFRENDZ was not operating.

- Timing tests between SPDS displays indicated the system was running slow, up to five seconds between displays.

- Called Murphy, Brief status discussion. Said that he had asked Lexa to check the SPDS displays since Buckley would not be at the site.

- Continued reviewing SPDS displays.

- Discussed some problems with the SPDS displays with Goebel.

- Allen Massey arrived from Atlanta and Tom Strickland arrived from Huntsville.

REPORTED BY:

J.H. McCleskey

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 09/04/85	LOCATION: CNS	SEQUENTIAL PAGE NO. 12

TEST PROCEDURE NO.:	TEST PROCEDURE TITLE:
N/A	N/A

DESCRIPTION OF TEST:

N/A

COMMENTS /OBSERVATIONS:

- Spent most of the day looking at SPDS displays (see SPDS DISPLAY REVIEW notes).

- SPDS display to display times were running up to eight seconds.

- Started filling out SAIC PMIS problem and request forms on the problems I've found. The Display Notes will reference the problem report number. A copy of the problem reports are attached to these notes.

- Discussed current status of PMIS with Lexa. He will send me his notes and write up from his visit at CNS for comments.

- Strickland is going through a cleanup process prior to rebuilding the system today. Work on the NSSS software is holding for the present.

REPORTED BY:

J.H. McCleskey

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 09/05/85	LOCATION: CNS	SEQUENTIAL PAGE NO. 13

TEST PROCEDURE NO.:	TEST PROCEDURE TITLE:
N/A	N/A

DESCRIPTION OF TEST:

N/A

COMMENTS /OBSERVATIONS:

- Continued review of SPDS displays.

- Strickland and Massey are working on the bugs in the PMIS.

- ODI was run early (01:30) this morning. Uncovered problems with the hardware when the tip reached the top of the core. All four indications (TOP) were tripped with one TIP.

- Continued documentating SPDS display problems on the station (SAIC) log forms, Data Base Change Request and Software Change Request. I reviewed the current problem station documentation and then completed 11 undocumented problem reports for the material observed during the SPDS Display Review.

- Called Lexa, discussed the package he is sending and whether or not it is worth while for me to stay at CNS while development work continues on the PMIS. General consenses is that it is not worth while to stay. V&V should probably stop observation until the PMIS development work is completed.

  I agreed to complete station change requests for the problems Lexa has found and documented if they have not been previously documented by the station.

  I will complete one RC for all the problems V&V documents, and track the identity of the station problem reports in the V&V documentation.

  The overnight package Lexa sent to CNS for me did not arrive.

- Peterson, Massey, and Strickland were running ODI in conjuction with TIP insertions and withdrawls about 9:00 PM. From discussions with

REPORTED BY:

J.H. McCleskey

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 09/05/85	LOCATION: CNS	SEQUENTIAL PAGE NO. 14

TEST PROCEDURE NO.:	TEST PROCEDURE TITLE:
N/A	N/A

DESCRIPTION OF TEST:

N/A

COMMENTS /OBSERVATIONS:

them it appears that the PMIS is getting data, however the ODI program is having problems interpreting the data.

REPORTED BY: J.H. McCleskey

VALIDATION/FIELD VERIFICATION TEST LOG	DATE: 09/06/85	LOCATION: CNS	SEQUENTIAL PAGE NO. 15

TEST PROCEDURE NO.: N/A

TEST PROCEDURE TITLE: N/A

DESCRIPTION OF TEST:

N/A

COMMENTS /OBSERVATIONS:

- The TIP problem appears to be caused by a mechanical cam which may or may not stop at the same position when the TIP's reach the top of the core. Current problem is how to interprete the cam position and resultant signal with respect to the TIP location.

- Murphy arrived at the plant this morning. Discussed my activities to date.

- Strickland discovered that the DEC/VAX was swapping pages in and out of core memory which was not necessary considering the available size of the core.. He reset the system parameters to eliminate this process. Apparently the DEC engineers set up this configuration prior to the machine leaving the DEC factory. This action provided some increased efficiency in the VAX's operation resulting in better time response.

- Lexa's package has not arived (12:10), left the plant for the airport.

REPORTED BY:

J.H. McCleskey

October 20, 1985

Mr. Jim Murphy
Project Manager, PMIS
Nebraska Public Power District
1414 15th Street
Columbus, NE 68601

DEC 7 1985

Mr. Murphy:

Subject: FPE SPDS testing

The attached Parts A, B, and C of this letter document the SPDS testing that was performed by FPE at Cooper Nuclear Station on October 3 and 4, 1985.

Part A - Summary of Problems
Part B - Details of Deviations Observed During Testing
Part C - Test Documentation

Problems uncovered during the testing consisted of;

1. Logic programming errors
2. Logic errors
3. Documentation errors
4. Point ID program errors
5. Display errors
6. Method of calculation problems

Eighteen specific problems which were documented during the test are briefly summarized on the two pages of Part A. Part B describes the problems in detail, and Part C contains the complete test data observed over the two days of testing at Cooper Nuclear Station.

During the testing it was observed that two generic problems exist with the SPDS displays. The first is the way that the rate of change of a parameter is calculated and the second is displaying the color red for a normal plant operating condition.

The current digital displays of a parameter rate of change can and do jump from one value to the next with each display refresh. The displayed number may be a large negative number and then jump to an even larger positive number. The displayed information is not helpful and can not used by the operator to infer where the plant parameters may be heading.
The second problem is that during routine plant operations the SPDS display should only have green or neutral (non-commanding attention) colors. When the color red is used for normal operating conditions, the operator becomes accustom to the display and may not notice an extra red in the display which is signifying an unacceptable plant condition.

More testing, if performed, should first consolidate and identify the testing performed during the FAT with this testing. Test scenarios could then be written to cover the remaining untested areas of the SPDS.

Respectfully,

Joseph H. McCleskey PE
Nuclear Engineer

copy to: C. Goebel
M. T. Culjat

PART A - SUMMARY OF PROBLEMS

This part is a brief summary of the problems documented during the SPDS testing which was performed at Cooper Nuclear Station on October 3 and 4, 1985.

1. CONTAINMENT INTEGRITY SFI

The logic for the calculation of points SPDS0069, SPDS0090, SPDS0091, and SPDS0092 is not described in Ref. 1.

A documentation error on page 3-8 was found. For point N625 (at left bottom), only SPDS0091 is calculated from this point.

2. Any SRM Bypassed ESI

The results of the test of this ESI do not agree with the documentation on page 6-2 (bottom of page).

3. SRV and SV Status ESI

This logic diagram does not make sense. With respect to this test, the observed results do not follow the logic diagram at the second decision box.

4. CS pump ESI's

The input point programming for these ESI's are incorrect.

5. Drywell O2 Limit

The results of this test do not match the documentation in Ref. 1 (page 6-24, mid page) which specifies a color of green for a point value of zero.

6. Supp chbr O2 limit

The results of this test do not match the documentation in Ref. 1 (page 6-24), which specifies a color of green for a point value of zero.

7. RPV saturation temperature limit

The results of this test do not match the documentation in Ref. 1 at the bottom of page 6-24, which specifies a color of green for a value of zero.

8. RPV pressure high, level increasing

The results of this test do not match the documentation in Ref. 1 at the bottom of page 6-24, which gives the following values for SPDS0233.

9. RPV pressure intermediate, level increasing

The results of this test do not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS024B.

10. RPV pressure low, level increasing

The results of this test do not match the documentation in Ref. 1 at the top of page 6-25.

11. RPV pressure high or intermediate, level decreasing

The results of this test do not match the documentation in Ref. 1 at the top of page 6-25.

12. RPV pressure low, level decreasing

The results of this test do not match the documentation in Ref. 1 at the top of page 6-25.

13. PLANT OVERVIEW, APRM BAR

The point values do not match their corresponding values on the display.

14. PLANT OVERVIEW, RPV Level BAR

The displayed point value for SPDS0020 does not appear to track the Rate of Change digital display.

15. REACTIVITY CONTROL, APRM BAR

The point value for the Average APRM does not match the displayed current value of Bar 1.

16. REACTIVITY CONTROL, SRM BAR

The point value for SRM bar driver does not equal the displayed bar length.

17. REACTIVITY CONTROL, REACTOR PERIOD

The reactor period is of little value as it is currently displayed.

18. RHR PUMP NPSH LIMITS

The point values being input to this calculation do not give the results predicted by the logic shown in the diagram.

PART B - DETAILS OF DEVIATIONS OBSERVED DURING TESTING

This part of the documentation describes in detail the nonconformances which were observed during the testing.

Chapter 5 of Reference 1.

1. Paragraph 5.4, page 5-19, CONTAINMENT INTEGRITY SFI

This SFI is MAGENTA. Figure 5-12, page 5-22, is the logic diagram for a magenta SFI.

SPDSBOX4 is the driver for the SFI, and is magenta due to the following input points:

SPDS0051 = 0/NCAL/magenta
SPDS0100 = 0/NCAL/magenta
SPDS0069 = 0/NCAL/magenta

These points are driven by:

SPDS0051 (page 3-8, mid page)
M163 = 0/BAD/magenta
M162 = 0/BAD/magenta
M161 = 127/REDU/magenta
N276 = 244/REDU/magenta
N277 = 253/REDU/magenta

SPDS0100 (page 3-9, top page)
SPDS0090 = 0/NCAL/magenta
SPDS0091 = 0/NCAL/magenta
SPDS0092 = 0/NCAL/magenta

SPDS0069 (page 9-29 & 9-30, paragraph 9.6.C)
N630 = NO/GOOD/green; Torus Sample
N631 = NO/GOOD/green; Range 1
N632 = NO/GOOD/green; Range 2
N633 = NO/GOOD/green; Range 3
N061 = 1.33/GOOD/green; Analog Value, Range 1
N062 = 0/BAD/magenta; Analog Value, Range 2
N063 = 0/BAD/magenta; Analog Value, Range 3

NOTE: The actual logic for the calculation of points SPDS0069, SPDS0090, SPDS0091, and SPDS0092 is not described in Ref. 1. It appears that the logic could be somewhat complicated in that only one instrument is used to drive points N061, N062, N063, and N277 through N633. These in turn are used to calculate the SPDS points. Since the instrument can only sample at one point and one range at a time, all other points will be NCAL or BAD. During the testing, the results of the logic calculation was not

acceptable. The calculation has four different results, only one of which is being calculated at any one instant of time. According to Ref. 1 this time period is "significant dwell time".

To be of value to the operators, the logic must include a way to maintain the last calculated value of an SPDS point during the calculation of the other three SPDS points.

NOTE: A documentation error on page 3-8 was found. For point N628 (at left bottom), only SPDS0091 is calculated from this point. Both SPDS0091 and SPDS0092 are documented as being calculated from this point.

Chapter 6 of Reference 1

2. Paragraph 6.1.1.8, page 6-10, Any SRM Bypassed ESI

The ESI is green and is driven by:

A533 = 0/GOOD/green

NOTE: This does not agree with the documentation on page 6-2 (bottom of page). The documentation in Ref. 1 specifies a point value of 1 and the color green for the point A533.

3. Paragraph 6.1.3.3, page 6-14, SRV and SV Status ESI

This ESI is green (Figure 8-8, page 8-25), and is driven by:

SPDS0050 = 0/GOOD/green "CLOSED"

The logic diagram is shown in Figure 6-5, page 6-16. Using the diagram:

- Healthy Inputs are Available
- SPDS0050 = Sum of Healthy Inputs
- All SV's and SRV's Closed
- ESI is green

NOTE: This logic diagram does not make sense. If only one Healthy input was available, the first decision box (Any Healthy Inputs Available) would be YES. This would leave only the Green or Red color box for a color choice. Since most of the inputs are BAD, a color of Green or Red is not correct. The second decision box (SPDS0050 > 0), where the value of SPDS0050 is the Sum of the Healthy Inputs, should be the number of Healthy Inputs, i.e. a number larger than zero.

With respect to this test, the observed results do not follow the logic diagram at the second decision box, i.e. SPDS0050 = 0.

4. Paragraph 6.1.4.2, page 6-18, CS pump ESI's

These ESI's are red (Figure 9-19, page 9-51) and are driven by:

N578 = 1/HALM/red "ON"
N580 = 1/HALM/red "ON"

* NOTE: A check with the control room confirmed that the CS pumps were not on. The input point programming for these ESI's are incorrect.

5. page 6-24, Drywell O2 Limit

This EOPSI is driven by SPDS009B which has a value of

SPDS009B = 0/NCAL/magenta

NOTE: This does not match the documentation in Ref. 1 (page 6-24, mid page) which specifies a color of green for a point value of zero.

6. page 6-24, Supp chbr O2 limit

This EOPSI is driven by SPDS010B which has a value of

SPDS010B = 0/NCAL/magenta

NOTE: This does not match the documentation in Ref. 1 (page 6-24), which specifies a color of green for a point value of zero.

7. page 6-24, RPV saturation temperature limit

This EOPSI is driven by SPDS023B. During the testing this point was observed to be

0/NCAL/magenta

NOTE: This does not match the documentation in Ref. 1 at the bottom of page 6-24, which specifies a color of green for a value of zero.

8. page 6-24, RPV pressure high, level increasing

This EOPSI is driven by SPDS027B. During the testing this point was observed to alternate between

1/HALM/red
0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the bottom of page 6-24, which gives the following values for SPDS027B.

Blank/0
Cyan/1
Magenta/validation failure

9. page 6-25, RPV pressure intermediate, level increasing

This EOPSI is driven by SPDS024B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS024B.

Blank/0
Cyan/1
Magenta/validation failure

10. page 6-25, RPV pressure low, level increasing

This EOPSI is driven by SPDS025B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS025B. The documentation also identifies the point as SPDS025, i.e. no B.

Blank/0
Cyan/1
Magenta/validation failure

11. page 6-25, RPV pressure high or intermediate, level decreasing

This EOPSI is driven by SPDS026B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS026B.

Blank/0
Cyan/1
Magenta/validation failure

12. page 6-25, RPV pressure low, level decreasing

This EOPSI is driven by SPDS027B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS027B.

Blank/0
Cyan/1
Magenta/validation failure

Chapter 7 in Reference 1

13. Paragraph 7.1.1, page 7-2, Bar 1, APRM

The documentation matches the bar 1 display in the Plant Overview except for point value correlation.

NOTE: The bar is driven by SPDS0008. The point value for this point, when requested does not appear to track the displayed current value of the bar. There could be some correlation between these two in that the value of the displayed current value tends to follow the direction of the point value. The input points that drive SPDS0008 are SPDS0006 and SPDS007. The point values for these points when displayed does not match the bar current value. These two points are driven by B000 through B005. The point value for each of these points when displayed does not match the bar displayed current value.

All points in this display, including the Rate of Change point do not appear to track their corresponding point values.

14. Paragraph 7.1.3, page 7-2, Bar 3, RPV Level

The documentation matches the Bar 3 display. The displayed point value of SPDS0019 tracks the display.

NOTE: The displayed point value for SPDS0020 does not appear to track the Rate of Change digital display.

Chapter 8 in Reference 1

15. Paragraph 8.1.1.1, page 8-2, Bar 1, APRM

The documentation matches Bar 1 of the display. Point value for SPDS0008 does not correlate to the current value of the Bar 1 display. Point value for SPDS0009 changes every second. The current value of the Rate of Change changes every two seconds and matched every other displayed point value.

NOTE: The point value for SPDS0008 does not match the displayed current value of Bar 1.

16. Paragraph 8.1.1.2, page 8-2, Bar 2, SRM

The documentation matches Bar 2 of the display. The point value for SPDS0013 does not match the Bar length in the display. The point value for SPDS0014 is in fair agreement with the displayed current value.

NOTE: The point value for SPDS0013 = -0.04/GOOD/green. The displayed Bar 2 length is 0.99. These two numbers should be equal.

17. Paragraph 8.1.3, page 8-4, Reactor Period

The reactor period point value SPDS0015 is sometimes the same as the displayed current value.

NOTE: The reactor period (SPDS0015) is a problem and it may be difficult to test this SPDS calculation. This point is calculated every second. Since the displayed period for the second(n) is actually calculated using second(n-1) values, to calculate the period requires a print out of the reactor period driving point values every second. In the Reactivity Control - Trend display the period is refreshed every three seconds. During the test it was not possible to display these values in a way that they could be hard copied. The attempts to extract the driving points and a value for the period yielded driving point numbers which when used to calculate a period did not match the displayed period. The period is also subject to wild fluctuations during constant or near constant reactor power operation.

Chapter 9 in Reference 1

18. Paragraph 9.8, page 9-42, RHR PUMP NPSH LIMITS

RHR LOOP A FLOW
The Y (SPDS0063) and the X (N004) values for this plot track the point values for each.

RHR LOOP B FLOW
The Y (SPDS0064) and the X (N005) values for this plot track the point values for each.

NOTE: The logic diagram for the NPSH Limit EOPSI is shown on Figure 9-13, page 9-47. The point values being input to this calculation do not give the results predicted by the logic shown in the diagram.

The first set of points have values of:
N000 = 7/OALM/green
N001 = -3/LRL/magenta

N004 = -1197/LRL/magenta
N005 = 2025/LALM/red

The first decision box checks the health of these points. Since two of the points are not healthy, the result of the check should be a NO from that box. The NO path leads to a magenta EOPSI box. Since the EOPSI (RPV WATER LEVEL) is red, the program logic is not correct.

The next two decision boxes check the health of SPDS006J and the health of SPDS0045. Both are healthy which results in a yes from these two boxes. The next four boxes check to determine whether or not the point f(X,Y) is greater than the Limit Curves for the Core Spray and RHR pumps. The results from these decisions are a NO, which leads to the green EOPSI box. However, since the EOPSI is red, the logic again is questionable. Correcting the first logic error could eliminate this problem.

PART C - TEST DOCUMENTATION

PMIS SPDS TESTING AT COOPER NUCLEAR STATION

This document describes additional testing which was performed to verify the algorithms described in the Detailed Descriptions of the Displays for the Cooper Nuclear Station Safety Parameter Display System (1). The testing was performed on October 3 and 4, 1985. The reactor was operating at 98 to 100 percent power during the two days of testing. The operating plant parameters which were being monitored by the PMIS were used as test input values, i.e. the test scenario.

The test was performed using chapters 5, 6, 7, 8, and 9 in Reference 1 as the expected test results. An IDT in the Technical Support Center was used to display point values and the results of SPDS point calculations, i.e. the SPDS displays. These values and the results of the calculations were then compared against Reference 1. Any differences between the observed displays and displayed point values are documented here. All results observed from the testing are described. Copies of the logic diagrams from Reference 1, are used to support the results of this testing. The path that was tested in the logic diagram is marked on the attached figures.

All page, figure, and paragraph numbers used to describe the testing are from Reference 1. Chapters 2, 3, and 4 of Reference 1 were used as support material during the test. This included point quality definitions and PMIS point definitions. The healthy and non-healthy qualities are defined on page 2-5.

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1. Buckley, D. W. and Lobner, P. R., "Detailed Descriptions of the Displays for the Cooper Nuclear Station Safety Parameter Display System (SPDS), Revision 2, Science Applications International Corporation, Feb., 1985

I. TESTING IN CHAPTER 5

The following tests were performed using Chapter 5 as the expected results with the reactor at 100 % power.

1. Paragraph 5.1, page 5-3, REACTIVITY CONTROL SFI

   This SFI is GREEN. Since only the YELLOW, RED, and MAGENTA color box logic diagrams are given, all conditions which give these three colors did not exist. The test results are that all the inputs defined on pages 5-4, 5-5, and 5-6 are healthy and with in the range of values required for a green SFI box.

2. Paragraph 5.2, page 5-7, CORE COOLING SFI

   This SFI is GREEN. Since only the YELLOW, RED, and MAGENTA color box logic diagrams are given, all conditions which give these three colors did not exist. The test results are that all the inputs defined on pages 5-8, 5-9, and 5-10 are healthy and with in the range of values required for a green SFI box.

3. Paragraph 5.3, page 5-11, COOLANT SYSTEM INTEGRITY SFI

   This SFI is MAGENTA. Figure 5-9, page 5-18, is the logic diagram for a magenta SFI.

   SFDSBOX3 is the driver for the SFI, and is magenta due to input point N063, which is 0/LRL/magenta (which is not healthy).

4. Paragraph 5.4, page 5-19, CONTAINMENT INTEGRITY SFI

   This SFI is MAGENTA. Figure 5-12, page 5-22, is the logic diagram for a magenta SFI.

   SFDSBOX4 is the driver for the SFI, and is magenta due to the following input points:

   SFDS0051 = 0/NCAL/magenta
   SFDS0100 = 0/NCAL/magenta
   SFDS0069 = 0/NCAL/magenta

   These points are driven by:

   SFDS0051 (page 3-8, mid page)
   M163 = 0/BAD/magenta
   M162 = 0/BAD/magenta
   M161 = 127/REDU/magenta
   N276 = 244/REDU/magenta
   N277 = 253/REDU/magenta

SPDS0100 (page 3-9, top page)
SPDS0090 = 0/NCAL/magenta
SPDS0091 = 0/NCAL/magenta
SPDS0092 = 0/NCAL/magenta

SPDS0069 (page 9-29 & 9-30, paragraph 9.6.C)
N630 = NO/GOOD/green: Torus Sample
N631 = NO/GOOD/green: Range 1
N632 = NO/GOOD/green: Range 2
N633 = NO/GOOD/green: Range 3
N061 = 1.85/GOOD/green: Analog Value, Range 1
N062 = 0/BAD/magenta: Analog Value, Range 2
N065 = 0/BAD/magenta: Analog Value, Range 3

NOTE: The actual logic for the calculation of points SPDS0069, SPDS0090, SPDS0091, and SPDS0092 is not described in Ref. 1. It appears that the logic could be somewhat complicated in that only one instrument is used to drive points N061, N062, N065, and N627 through N633. These in turn are used to calculate the SPDS points. Since the instrument can only sample at one point and one range at a time, all other points will be NCAL or BAD. During the testing, the results of the logic calculation was not acceptable. The calculation has four different results, only one of which is being calculated at any one instant of time. According to Ref. 1 this time period is "significant dwell time".

To be of value to the operators, the logic must include a way to maintain the last calculated value of an SPDS point during the calculation of the other three SPDS points.

NOTE: A documentation error on page 3-8 was found. For point N628 (at left bottom), only SPDS0091 is calculated from this point. Both SPDS0091 and SPDS0092 are documented as being calculated from this point in Ref. 1.

5. Paragraph 5.5, page 5-23, RADIOACTIVE RELEASE SFI

This SFI is magenta. The logic diagram is Figure 5-15, page 5-25. Using the logic diagram

- N079 = 0/LRL/magenta
- N073 = 0/LRL/magenta
- N074 = 0/LRL/magenta
- N069 = 0/LRL/magenta
- SPDS0078 = 0/NCAL/magenta

The inputs for SPDS0078 (calculation given on page 3-39) are
N082 = 0/BAD/magenta
N083 = 0/BAD/magenta
N084 = 14/GOOD/green
N085 = 19/GOOD/green

II. TESTING IN CHAPTER 6

The following tests were performed on the ESI's using the material documented in Chapter 6 as the expected results with the reactor at 100 % power.

1. Paragraph 6.1.1.1, page 6-7, All APRM Downscale ESI

   The logic flow is shown in Figure 6-1, page 6-8. Using the logic diagram:

   - all inputs are healthy
   - all APRM are not < 2.5 %
   - at least one APRM > 2.5 %
   - SPDS0080 = 0
   - ESI is green

2. Paragraph 6.1.1.2, page 6-7, Any APRM Upscale ESI

   The ESI is green and driven by:

   A527 = 0/GOOD/green

3. Paragraph 6.1.1.3, page 6-7, Any APRM Inoperative ESI

   The ESI is green and driven by:

   A528 = 0/GOOD/green

4. Paragraph 6.1.1.4, page 6-9, Any Aprm Bypassed ESI

   The ESI is green and is driven by:

   SPDS0001 = 1/GOOD/green

   The inputs to point SPDS0001 are
   A535 = 0/GOOD/green
   A536 = 0/GOOD/green
   A537 = 0/GOOD/green
   A538 = 0/GOOD/green
   A539 = 0/GOOD/green
   A540 = 0/GOOD/green

5. Paragraph 6.1.1.5, page 6-9, SRM Position ESI

   The ESI is green and is driven by:

   A519 = 0/GOOD/green

6. Paragraph 6.1.1.6, page 6-10, Any SRM Upscale ESI

   The ESI is green and is driven by:

A521 = 0/GOOD/green

7. Paragraph 6.1.1.7, page 6-10, Any SRM Inoperative ESI

The ESI is green and is driven by:

A521 = 0/GOOD/green

8. Paragraph 6.1.1.8, page 6-10, Any SRM Bypassed ESI

The ESI is green and is driven by:

A533 = 0/GOOD/green

NOTE: This does not agree with the documentation on page 6-2 (bottom of page). The documentation in Ref. 1 specifies a point value of 1 and the color green for the point A533.

9. Paragraph 6.1.1.9, page 6-10, All Rods In ESI

The ESI is green and is driven by:

N520 = 0/GOOD/green

10. Paragraph 6.1.1.10, page 6-10, Reactor Scram ESI

The logic diagram for this ESI is shown in Figure 6-2, page 6-11. Using the diagram:

- SPDS0083 is healthy
- SPDS0083 = 1
- No scram
- SPDS0039 = 0
- ESI is green

11. Paragraph 6.1.2, page 6-10, RPV and Containment Isolation System ESI's

There are 7 ESI's, each driven by:

SPDS0032 = GP1 RST/GOOD/green
SPDS0033 = GP2 RST/GOOD/green
SPDS0034 = GP3 ISO/ALM/red
SPDS0035 = GP4 ISO/ALM/red
SPDS0036 = GP5 ISO/ALM/red
SPDS0037 = GP6 ISO/ALM/red
SPDS0038 = GP7 ISO/ALM/red

All displayed ESI's match the above respective colors. The input points for these SPDS points (top of page 6-12) were not checked in this test.

12. Paragraph 6.1.3.1, page 6-12, Safety Relief Valve ESI's

All ESI's are green (Figure 8-12, page 8-36) and are driven by;

SPDS0089 = 0/GOOD/green
SPDS0093 = 0/GOOD/green
SPDS0094 = 0/GOOD/green
SPDS0095 = 0/GOOD/green
SPDS0096 = 0/GOOD/green
SPDS0097 = 0/GOOD/green
SPDS0098 = 0/GOOD/green
SPDS0099 = 0/GOOD/green

The logic diagram is shown in Figure 6-3, page 6-13. Using the diagram:

- All Position Switch Inp t A Healthy (table on Figure)
- All Tailpipe Temperature Input B Healthy
- All input A does not = 1
- All input B is not >= HALM
- All SPDSXXXX = 0
- All ESI' are green

13. Paragraph 6.1.3.2, page 6-12, Safety Valve ESI's

These ESI's are green (Figure 8-12, page 8-36B), and are driven by;

SPDS0040 = 0/GOOD/green
SPDS0041 = 0/GOOD/green
SPDS0042 = 0/GOOD/green

The logic diagram is shown in Figure 6-4, page 6-15. Using the diagram:

- All Input A are Healthy (table on Figure)
- All Input B are Healthy
- All Input Quality are not BEDU
- All Temp Input B are not >= HALM
- All SPDSXXXX = 0
- All ESI's are green

14. Paragraph 6.1.3.3, page 6-14, SRV and SV Status ESI

This ESI is green (Figure 8-8, page 8-28), and is driven by:

SPDS0050 = 0/GOOD/green "CLOSED"

The logic diagram is shown in Figure 6-5, page 6-16. Using the diagram:

- Healthy Inputs are Available
- SPDS0050 = Sum of Healthy Inputs
- All SV's and SRV's Closed
- ESI is green

NOTE: This logic diagram does not make sense. If only one Healthy input was available, the first decision box (Any Healthy Inputs Available) would be YES. This would leave only the Green or Red color box for a color choice. Since most of the inputs are BAD, a color of Green or Red is not correct. The second decision box (SPDS0050 > 0), where the value of SPDS0050 is the Sum of the Healthy Inputs, should be the number of Healthy Inputs, i.e. a number larger than zero.

With respect to this test, the observed results do not follow the logic diagram at the second decision box, i.e. SPDS0050 = 0.

15. Paragraph 6.1.3.4, page 6-14, MSIV Status ESI

The logic diagram is shown in Figure 6-6, page 6-17. Using the diagram;

- All Inputs N797 to N804 are Healthy
- All Inputs N797 to N804 = 1
- SPDS0010 = 2/HALM/red
- ESI is Red and "OPEN"

16. Paragraph 6.1.4.1, page 6-14, RHR pump ESI's

These ESI's are green (Figure 9-17, page 9-46) and are driven by;

N861 = 0/GOOD/green "OFF"
N862 = 0/GOOD/green "OFF"
N863 = 0/GOOD/green "OFF"
N864 = 0/GOOD/green "OFF"

17. Paragraph 6.1.4.2, page 6-16, CS pump ESI's

These ESI's are red (Figure 9-17, page 9-31) and are driven by:

N578 = 1/HALM/red "ON"
N580 = 1/HALM/red "ON"

* NOTE: A check with the control room confirmed that the CS pumps were not on. The input point programming for these ESI's are incorrect.

18. Paragraph 6.1.4.3, page 6-16, HPCI pump ESI

The logic diagram is shown in Figure 6-7, page 6-20. Using the diagram:

- Input N002 = 11/LALM/red and is Healthy
- Input N002 is not > LALM
- SPDS0085 = 0/GOOD/green
- ESI is green

19. Paragraph 6.1.4.4, page 6-18, RCIC Pump ESI

The logic diagram is shown in Figure 6-8, page 6-21. Insufficient information was recorded to test this ESI.

20. Paragraph 6.1.4.5, page 6-19, Drywell Sump Pump ESI

The logic diagram is shown in Figure 6-9, page 6-22. Using the diagram:

- Input N059 = 0/LALM/red and is Healthy
- Pump A ON, N059 is not > LALM
- Input N060 = 0/LRL/magenta and is not Healthy
- SPDS0054 = 0/NCAL/magenta
- The ESI is magenta

All the EOPSI's identified in Chapter 6, page 6-23, are tested with the material documented in Chapter 9. There are several documentation discrepancies in this material. They are:

21. page 6-24, Drywell O2 Limit

This EOPSI is driven by SPDS009B which has a value of

SPDS009B = 0/NCAL/magenta

NOTE: This does not match the documentation in Ref. 1 (page 6-24, mid page) which specifies a color of green for a point value of zero.

22. page 6-24, Supp chbr O2 limit

This EOPSI is driven by SPDS010B which has a value of

SPDS010B = 0/NCAL/magenta

NOTE: This does not match the documentation in Ref. 1 (page 6-24), which specifies a color of green for a point value of zero.

23. page 6-24, RPV saturation temperature limit

This EOPSI is driven by SPDS023B. During the testing this point was observed to be

0/NCAL/magenta

NOTE: This does not match the documentation in Ref. 1 at the bottom of page 6-24, which specifies a color of green for a value of zero.

24. page 6-24, RPV pressure high, level increasing

This EOPSI is driven by SPDS023B. During the testing this point was observed to alternate between

I/HALM/red
O/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the bottom of page 6-24, which gives the following values for SPDS023B.

Blank/0
Cyan/1
Magenta/validation failure

25. page 6-25, RPV pressure intermediate, level increasing

This EOPSI is driven by SPDS024B. During the testing this point was observed to be

O/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS024B.

Blank/0
Cyan/1
Magenta/validation failure

26. page 6-25, RPV pressure low, level increasing

This EOPSI is driven by SPDS025B. During the testing this point was observed to be

O/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS025B. The documentation also identifies the point as SPDS025, i.e. no B.

Blank/0
Cyan/1
Magenta/validation failure

27. page 6-25, RPV pressure high or intermediate, level decreasing

This EOPSI is driven by SPDS026B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS026B.

Blank/0
Cyan/1
Magenta/validation failure

28. page 6-25, RPV pressure low, level decreasing

This EOPSI is driven by SPDS027B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS027B.

Blank/0
Cyan/1
Magenta/validation failure

29. Paragraph 6.2, page 6-26, System Alarm Area Indicator

The logic diagram for this indicator is shown in figure 6-10. Using the diagram:

- All inputs are not Healthy
  - SPDS009B = 0/NCAL/magenta
  - SPDS010B = 0/NCAL/magenta
  - SPDS029B = 0/NCAL/magenta
- SAA Indicator is a Magenta "E"

III. TESTING IN CHAPTER 7

The following tests were performed on the Level 1 display, PLANT OVERVIEW.

1. Paragraph 7.1.1, page 7-2, Bar 1, APRM

   The documentation matches the bar 1 display in the Plant Overview except for point value correlation.

NOTE: The bar is driven by SPDS0008. The point value for this point, when requested does not appear to track the displayed current value of the bar. There could be some correlation between these two in that the value of the displayed current value tends to follow the direction of the point value. The input points that drive SPDS0008 are SPDS0006 and SPDS007. The point values for these points when displayed does not match the bar current value. These two points are driven by B000 through B005. The point value for each of these points when displayed does not match the bar displayed current value.

All points in this display, including the Rate of Change point do not appear to track their corresponding point values.

2. Paragraph 7.1.2, page 7-2, Bar 2, RPV Pressure

   The documentation matches the Bar 2 display. The following points used in Bar 2 appear to follow their respective point values.

   SPDS0030
   SPDS0031

3. Paragraph 7.1.3, page 7-2, Bar 3, RPV Level

   The documentation matches the Bar 3 display. The displayed point value of SPDS0019 tracks the display.

NOTE: The displayed point value for SPDS0020 does not appear to track the Rate of Change digital display.

4. Paragraph 7.1.4, page 7-3, Bar 4, Drywell pressure

   The documentation matches the Bar 3 display. The following points used in Bar 3 appear to follow their respective point values.

   SPDS0043
   SPDS0044

IV. TESTING IN CHAPTER 8

The following tests were performed on the Level 2 Displays.

1. Paragraph 8.1.1.1, page 8-2, Bar 1, APRM

   The documentation matches Bar 1 of the display. Point value for SPDS0008 does not correlate to the current value of the Bar 1 display. Point value for SPDS0009 changes every second. The current value of the Rate of Change changes every two seconds and matched every other displayed point value.

NOTE: The point value for SPDS0008 does not match the displayed current value of Bar 1.

2. Paragraph 8.1.1.2, page 8-2, Bar 2, SRM

   The documentation matches Bar 2 of the display. The point value for SPDS0013 does not match the Bar length in the display. The point value for SPDS0014 is in fair agreement with the displayed current value.

NOTE: The point value for SPDS0013 = -0.04/GOOD/green. The displayed Bar 2 length is 0.99. These two numbers should be equal.

3. Paragraph 8.1.3, page 8-4, Reactor Period

   The reactor period point value SPDS0015 is sometimes the same as the displayed current value.

NOTE: The reactor period (SPDS0015) is a problem and it may be difficult to test this SPDS calculation. This point is calculated every second. Since the displayed period for the second(n) is actually calculated using second(n-1) values, to calculate the period requires a print out of the reactor period driving point values every second. In the Reactivity Control - Trend display the period is refreshed every three seconds. During the test it was not possible to display these values in a way that they could be hard copied. The attempts to extract the driving points and a value for the period yielded driving point numbers which when used to calculate a period did not match the displayed period. The period is also subject to wild fluctuations during constant or near constant reactor power operation.

4. Paragraph 8.3.1.1, page 8-9, Narrow Range Rx Water Level

   The narrow range bar displays on the BAR/RPV MIMIC are refreshed every 2 seconds. The input point B021 for the NR A bar is calculated every second. Every other point

value display matches the NR A bar digital value. This is the same for all bars on this display.

5. The next three displays, CORE COOLING - TREND, COOLANT SYSTEM INTEGRITY - BAR, and COOLANT SYSTEM INTEGRITY - TREND, all have reasonable tracking between the point values and the displayed (bar, trend, & digital) values.

6. The CONTAINMENT INTEGRITY - BAR & TREND also have reasonable tracking between the point values and the displayed (bar, trend, & digital) values. The one exception which was not tested is the point SPDS0051, which is driven by the M151 points which are BAD. SPDS0051 drives Bar 2 and Plot 2 on these displays.

7. The RADIOACTIVE RELEASE displays were not tested.

V. TESTING IN CHAPTER 9

The following tests were performed on the Level 3 Displays.

1. Paragraph 9.1, page 9-3, HEAT CAPACITY TEMPERATURE LIMIT

   The Y (SPDS0063) and X (SPDS0030) inputs for this display track the point values for each point.

   The logic diagram for Heat Capacity Temperature Limit EOPSI is shown on Figure 9-2, page 9-7. Using the diagram

   - SPDS0030 is healthy
   - SPDS0063 is healthy
   - f(X,Y) is not >= Limit Curve
   - SPDS0008 = 0/GOOD/green
   - the EOPSI (SUPPRESSION CHAMBER MIMIC) is GREEN

2. Paragraph 9.2, page 9-8, HEAT CAPACITY LEVEL LIMIT

   The Y (SPDS0065) and X (SPDS0084) inputs for this display track the point values for each point.

   The logic diagram for Heat Capacity Level Limit EOPSI is shown on Figure 9-4, page 9-12. Using the diagram

   - SPDS0084 is healthy
   - SPDS0065 is healthy
   - f(X,Y) is not <= Limit Curve
   - SPDS0018 = 0/GOOD/green
   - the EOPSI (SUPPRESSION CHAMBER MIMIC) is green

3. Paragraph 9.3, page 9-13, SUPPRESSION POOL LOAD LIMIT

   The Y (SPDS0065) and X (SPDS0030) inputs for this display track the point values for each point.

   The logic diagram for Suppression Pool Load Limit EOPSI is shown on Figure 9-6, page 9-17. Using the diagram

   - SPDS0030 is healthy
   - SPDS0065 is healthy
   - f(X,Y) is not >= Limit Curve
   - SPDS0028 = 0/GOOD/green
   - the EOPSI (SUPPRESSION CHAMBER MIMIC) is green

4. Paragraph 9.4, page 9-18, CONTAINMENT PRESSURE LIMITS

   The Y (SPDS0045) and X (SPDS0067) inputs for this display track the point values for each point.

   The logic diagram for the Containment Pressure Limit EOPSI is shown on Figure 9-8, page 9-22. Using the diagram

- SPDS0067 is healthy
- SPDS0045 is healthy
- f(X,Y) is not >= Limit Curve #1
- SPDS004B = 0/GOOD/green
- the EOPSI (CONTAINMENT INTEGRITY - TREND) is green

5. Paragraph 9.5, page 9-23,
DRYWELL SPRAY INITIATION PRESSURE LIMIT

The Y (SPDS006J) and X (SPDS0045) inputs for this display track the point values for each point.

The logic diagram for the Drywell Spray Initiation Pressure Limit EOPSI is shown on Figure 9-10, page 9-27. Using the diagram

- SPDS0045 is healthy
- SPDS006J is healthy
- f(X,Y) is not >= Limit Curve
- SPDS006B = 0/GOOD/green
- the EOPSI (CONTAINMENT INTEGRITY - TREND) is green

6. Paragraph 9.6, page 9-28, DRYWELL HYDROGEN AND OXYGEN STATUS

Drywell Hydrogen
The Y (T122) and X (SPDS0045) inputs for this plot track the point values for each point.

The logic diagram for the Drywell Hydrogen Concentration is shown on Figure 9-13, page 9-35. Using the diagram

- SPSD0045 is healthy
- T122 is healthy
- f(X,Y) is not >= Limit Curve
- SPDS007B = 0/GOOD/green
- the EOPSI (CONTAINMENT INTEGRITY - TREND) is green

Drywell Oxygen
This plot was not working.

The logic diagram for the Drywell Oxygen Concentration Limit is shown on Figure 9-14, page 9-36. Using the diagram

- SPDS0045 is healthy
- SPDS0100 is not healthy
- SPDS009B is not healthy
- the EOPSI (CONTAINMENT INTEGRITY - TREND) is magenta

The input point values for SDPS0100 are

SPDS0100 = 0/NCAL/magenta
SPDS0090 = 0/NCAL/magenta
SPDS0091 = 0/NCAL/magenta
SPDS0092 = 0/NCAL/magenta

7. Paragraph 9.7, page 9-37, SUPPRESSION CHAMBER HYDROGEN AND OXYGEN

This plot, the Torus O2 Concentration was not working.

The logic diagram for the SUPPRESSION Chamber Oxygen Concentration Limit is shown on Figure 9-16, page 9-41. Using the diagram

- SPDS0045 is healthy
- SPDS0069 is not healthy
- SPDS0108 is not healthy
- the EOPSI (SUPPRESSION CHAMBER MIMIC) is magenta

8. Paragraph 9.8, page 9-42, RHR PUMP NPSH LIMITS

RHR LOOP A FLOW
The Y (SPDS0063) and the X (N004) values for this plot track the point values for each.

RHR LOOP B FLOW
The Y (SPDS0067) and the X (N005) values for this plot track the point values for each.

NOTE: The logic diagram for the NPSH Limit EOPSI is shown on Figure 9-18, page 9-47. The point values being input to this calculation do not give the results predicted by the logic shown in the diagram.

The first set of points have values of:
N000 = 7/DALM/green
N001 = -3/LRL/magenta
N004 = -1197/LRL/magenta
N005 = 2025/LALM/red

The first decision box checks the health of these points. Since two of the points are not healthy, the result of the check should be a NO from that box. The NO path leads to a magenta EOPSI box. Since the EOPSI (RPV WATER LEVEL) is red, the program logic is not correct.

The next two decision boxes check the health of SPDS0063 and the health of SPDS0045. Both are healthy which results in a yes from these two boxes. The next four boxes check to determine whether or not the point f(X,Y) is greater than the Limit Curves for the Core Spray and RHR pumps. The results from these decisions are a

NO, which leads to the green EOPSI box. However, since the EOPSI is red, the logic again is questionable. Correcting the first logic error could eliminate this problem.

9. Paragraph 9.9, page 9-48, CORE SPRAY PUMP NPSH LIMITS

The Y (SPDS0063) and the X (N000 and N001) values for this plot track the point values for each.

10. Paragraph 9.10, page 9-52, RPV SATURATION TEMPERATURE LIMIT

The Y (SPDS0051) and the X (SPDS0070) values for this plot track the point values for each.

The logic diagram for the RPV Saturation Temperature limit EOPSI is shown on Figure 9-12, page 9-56. Using the diagram

- SPDS0070 is healthy
- SPDS0051 is not healthy
- SPDS029B is not healthy
- the EOPSI (PLANT OVERVIEW) is magenta

11. Paragraph 9.11, insufficient data taken to test this part.

12. Paragraph 9.12, this display, L3.13, is not correct. The correct display is shown in EOP-1, on page 9 of 46. This display was not tested.

November 10, 1985

Mr. Jim Murphy
Project Manager, PMIS
Nebraska Public Power District
1414 15th Street
Columbus, NE 68601

DEC 7 1985

Mr. Murphy:

This letter summarizes the results of the discussion that Pete Lobner and I had during the SAIC NPPD meeting at CNS this week. Pete and I discussed the SPDS testing documented in the enclosures with the October 20, 1985 letter from PPE to you. A copy of that report is being sent with this letter.

As a result of the discussions between Pete Lobner and myself, I feel that further testing of the SPDS is probably not warranted. This recommendation is made solely by PPE and is not connected in any way with current PMIS V&V recommendations.

A detailed description of the disposition of each of the problems is attached to this letter (ATTACHMENT A). The description starts with the problem identification taken from Part B of the 10/20/85 letter and then explains how the item was resolved, who is recommended to resolve the problem, or that a station problem report was written.

A brief disposition of each of the eighteen problems identified in the test results of Part B of the 10/20/85 letter follows:

1. The drywell and torus oxygen calculation is documented as SSER054 and SSER057. The current action on this item is that NPPD is to resolve how to process the oxygen data. SAIC also agreed to revise the documentation of how the points were derived and to correct the error on page 3-8 of the SPDS description.

2. The "Any SRM Bypassed" ESI problem will be resolved by SAIC.

3. The SRV and SV Status ESI's are operating as they were designed by SAIC and NPPD and are not a problem.

4. NPPD is to verify that the proper field inputs are being used for the CS pump ESI's.

5. The "Drywell O2 Limit" EOPSI is thought to be operating as it was designed by SAIC and NPPD. However, this could not be confirmed and an SSER was completed for problems 5, 6, and 7 to track the items.

6. The "Supp chbr O2 limit" EOPSI is thought to be operating as it was designed by SAIC and NPPD. See problem 5 for action.

7. The "RPV saturation temperature limit" is thought to be operating as it was designed by SAIC and NPPD. See problem 5 for action.

8. The "RPV pressure high, level increasing" EOPSI problem will be corrected by SAIC.

9. The "RPV pressure intermediate, level increasing" EOPSI problem will be corrected by SAIC.

10. The "RPV pressure low, level increasing" EOPSI problem will be corrected by SAIC.

11. The "RPV pressure high or intermediate, level decreasing" problem will be corrected by SAIC.

12. The "RPV pressure low, level decreasing" EOPSI problem will be corrected by SAIC.

13. The APRM Bar current value with respect to the displayed point ID value has been documented with an SSER.

14. The RPV Level rate of change display with respect to the displayed point ID value has been documented with the same SSER used in problem 13.

15. The APRM Bar current value with respect to the displayed point ID value problem has been documented with the same SSER used in problem 13.

16. The SRM bar 2 length with respect to the displayed point value has been documented in SSCR039, and will be reviewed by SAIC and NPPD.

17. The Reactor Period problem has been documented as SSER062, and is to be corrected by SAIC.

18. The RHR PUMP NPSH LIMITS problem has been documented as SSCR034, and SAIC will verify the software for this EOPSI.

If there are any questions about the resolution and or action taken for these problems, PPE should be contacted.

Respectfully,

Joseph H. McCleskey PE
Nuclear Engineer

cc: Curt Goebel

ATTACHMENT A

The following discussion first states the problem as it was identified during the testing. Then the resolution or action for that problem is described.

Chapter 5 of Reference 1.

PROBLEM 1.
1. Paragraph 5.4, page 5-19, CONTAINMENT INTEGRITY SFI

This SFI is MAGENTA. Figure 5-12, page 5-22, is the logic diagram for a magenta SFI.

SPDSBOX4 is the driver for the SFI, and is magenta due to the following input points:

SPDS0051 = 0/NCAL/magenta
SPDS0100 = 0/NCAL/magenta
SPDS0069 = 0/NCAL/magenta

These points are driven by:

SPDS0051 (page 3-8, mid page)
M163 = 0/BAD/magenta
M162 = 0/BAD/magenta
M161 = 127/REDU/magenta
N276 = 244/REDU/magenta
N277 = 253/REDU/magenta

SPDS0100 (page 3-9, top page)
SPDS0090 = 0/NCAL/magenta
SPDS0091 = 0/NCAL/magenta
SPDS0092 = 0/NCAL/magenta

SPDS0069 (page 9-29 & 9-30, paragraph 9.6.C)
N630 = NO/GOOD/green; Torus Sample
N631 = NO/GOOD/green; Range 1
N632 = NO/GOOD/green; Range 2
N633 = NO/GOOD/green; Range 3
N061 = 1.85/GOOD/green; Analog Value, Range 1
N062 = 0/BAD/magenta; Analog Value, Range 2
N063 = 0/BAD/magenta; Analog Value, Range 3

NOTE: The actual logic for the calculation of points SPDS0069, SPDS0090, SPDS0091, and SPDS0092 is not described in Ref. 1. It appears that the logic could be somewhat complicated in that only one instrument is used to drive points N061, N062, N063, and N627 through N633. These in turn are used to calculate the SPDS points. Since the instrument can only sample at one point and

one range at a time, all other points will be NCAL or BAD. During the testing, the results of the logic calculation was not acceptable. The calculation has four different results, only one of which is being calculated at any one instant of time. According to Ref. 1 this time period is "significant dwell time".

To be of value to the operators, the logic must include a way to maintain the last calculated value of an SPDS point during the calculation of the other three SPDS points.

NOTE: A documentation error on page 3-8 was found. For point N628 (at left bottom), only SPDS0091 is calculated from this point. Both SPDS0091 and SPDS0092 are documented as being calculated from this point.

RECOMMENDED RESOLUTION of PROBLEM 1.
This problem has two parts, the drywell and torus oxygen calculation and a documentation error. The drywell and torus oxygen calculation was discussed during the meeting and has been previously documented as SSER054 and SSER057. The current action on this item is that NPPD is to resolve how to process the oxygen data (per Lobner's notes dated 11/6/85). SAIC also agreed to revise the discussion to describe more clearly how the points were derived in the SPDS documentation. The documentation problem on page 3-8 of the SPDS description will be revised by Pete Lobner in the next issue.

Chapter 6 of Reference 1

PROBLEM 2.
2. Paragraph 6.1.1.8, page 6-10, Any SRM Bypassed ESI

The ESI is green and is driven by:

ASJJ = 0/GOOD/green

NOTE: This does not agree with the documentation on page 6-2 (bottom of page). The documentation in Ref. 1 specifies a point value of 1 and the color green for the point ASJJ.

RECOMMENDED RESOLUTION of PROBLEM 2.

SAIC will resolve problem. see Lobner's notes dated 11/6/85. Part 3 of 11, PMIS Data Base Changes, item c.3).

PROBLEM 3.
3. Paragraph 6.1.3.3, page 6-14, SRV and SV Status ESI

This ESI is green (Figure 8-8, page 8-23), and is driven by:

SPDS0050 = 0/GOOD/green "CLOSED"

The logic diagram is shown in Figure 6-5, page 6-16. Using the diagram;

- Healthy Inputs are Available
- SPDS0050 = Sum of Healthy Inputs
- All SV's and SRV's Closed
- ESI is green

NOTE: This logic diagram does not make sense. If only one Healthy input was available, the first decision box (Any Healthy Inputs Available) would be YES. This would leave only the Green or Red color box for a color choice. Since most of the inputs are BAD, a color of Green or Red is not correct. The second decision box (SPDS0050 > 0), where the value of SPDS0050 is the Sum of the Healthy Inputs, should be the number of Healthy Inputs, i.e. a number larger than zero.

With respect to this test, the observed results do not follow the logic diagram at the second decision box, i.e. SPDS0050 = 0.

RECOMMENDED RESOLUTION of PROBLEM 2.

This ESI is operating as it was designed by SAIC and NPPD. The sum of the healthy inputs was incorrectly interpreted during the testing. The meaning of that statement is the sum of the values of the healthy inputs.

PROBLEM 4.
4. Paragraph 6.1.4.2, page 6-18, CS pump ESI's

These ESI's are red (Figure 9-19, page 9-51) and are driven by;

N078 = 1/HALM/red "ON"
N030 = 1/HALM/red "ON"

* NOTE: A check with the control room confirmed that the CS pumps were not on. The input point programming for these ESI's are incorrect.

RECOMMENDED RESOLUTION of PROBLEM 4.

This problem is documented in SSCR037, and per Lobner's notes dated 11/6/85, NPPD is to verify proper field inputs.

PROBLEM 5.
5. page 6-24, Drywell O2 Limit

This EOPSI is driven by SPDS009B which has a value of

SPDS009B = 0/NCAL/magenta

NOTE: This does not match the documentation in Ref. 1 (page 6-24, mid page) which specifies a color of green for a point value of zero.

RECOMMENDED RESOLUTION of PROBLEM 5.

This item may not a problem. Apparently the last valid data value of this point was zero (0). The quality of the point ID then changed to NCAL/magenta, however, the value of the point ID in the CVT remained zero (0) when the quality changed to NCAL. A SSER was written to further check this item and problems 6 and 7.

PROBLEM 6.
6. page 6-24, Supp chbr O2 limit

This EOPSI is driven by SPDS010B which has a value of

SPDS010B = 0/NCAL/magenta

NOTE: This does not match the documentation in Ref. 1 (page 6-24), which specifies a color of green for a point value of zero.

RECOMMENDED RESOLUTION of PROBLEM 6.

This item may not a problem. Apparently the last valid data value of this point was zero (0). The quality of the point ID then changed to NCAL/magenta, however, the value of the point ID in the CVT remained zero (0) when the quality changed to NCAL. See problem 5 for action on this item.

PROBLEM 7.
7. page 6-24, RPV saturation temperature limit

This EOPSI is driven by SPDS023B. During the testing this point was observed to be

0/NCAL/magenta

NOTE: This does not match the documentation in Ref. 1 at the bottom of page 6-24, which specifies a color of green for a value of zero.

RECOMMENDED RESOLUTION of PROBLEM 7.

This item may not a problem. Apparently the last valid data value of this point was zero (0). The quality of the point ID then changed to NCAL/magenta, however, the value of the point ID in the CVT remained zero (0) when the quality changed to NCAL. See problem 5 for action on this item.

PROBLEM 8.
8. page 6-24, RPV pressure high, level increasing

This EOPSI is driven by SPDS023B. During the testing this point was observed to alternate between

3/HALM/red
0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the bottom of page 6-24, which gives the following values for SPDS023B.

Blank/0
Cyan/1
Magenta/validation failure

RECOMMENDED RESOLUTION of PROBLEM 8.

SAIC will correct the problem according to Lober's notes dated 11/6/85, part 4 of II, item d.

PROBLEM 9.
9. page 6-25, RPV pressure intermediate, level increasing

This EOPSI is driven by SPDS024B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS024B.

Blank/0
Cyan/1
Magenta/validation failure

RECOMMENDED RESOLUTION of PROBLEM 9.

SAIC will correct the problem according to Lober's notes dated 11/6/85, part 4 of II, item d.

PROBLEM 10.
10. page 6-25, RPV pressure low, level increasing

This EOPSI is driven by SPDS025B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS025B. The documentation also identifies the point as SPDS025, i.e. no B.

Blank/0
Cyan/1
Magenta/validation failure

RECOMMENDED RESOLUTION of PROBLEM 10.

SAIC will correct the problem according to Lober's notes dated 11/6/85, part 4 of II, item d.

PROBLEM 11.
11. page 6-25, RPV pressure high or intermediate, level decreasing

This EOPSI is driven by SPDS026B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS026B.

Blank/0
Cyan/1
Magenta/validation failure

RECOMMENDED RESOLUTION of PROBLEM 11.

SAIC will correct the problem according to Lober's notes dated 11/6/85, part 4 of II, item d.

PROBLEM 12.
12. page 6-25, RPV pressure low, level decreasing

This EOPSI is driven by SPDS027B. During the testing this point was observed to be

0/GOOD/green

NOTE: This does not match the documentation in Ref. 1 at the top of page 6-25, which gives the following values for SPDS027B.

Blank/0
Cyan/1
Magenta/validation failure

RECOMMENDED RESOLUTION of PROBLEM 12.

SAIC will correct the problem according to Lober's notes dated 11/6/85, part 4 of II, item d.

Chapter 7 in Reference 1

PROBLEM 13.
13. Paragraph 7.1.1, page 7-2, Bar 1, APRM

The documentation matches the bar 1 display in the Plant Overview except for point value correlation.

NOTE: The bar is driven by SPDS0008. The point value for this point, when requested does not appear to track the displayed current value of the bar. There could be some correlation between these two in that the value of the displayed current value tends to follow the direction of the point value. The input points that drive SPDS0008 are SPDS0006 and SPDS007. The point values for these points when displayed does not match the bar current value. These two points are driven by B000 through B005. The point value for each of these points when displayed does not match the bar displayed current value.

All points in this display, including the Rate of Change point do not appear to track their corresponding point values.

RECOMMENDED RESOLUTION of PROBLEM 13.

The cause of this problem was not determined during the meeting at CNS. An SSER was written for this problem and the following two problems (SSER covers Problems 13, 14, & 15) to document the problem and to continue investigation on a broader scale than just in the area of SPDS.

PROBLEM 14.
14. Paragraph 7.1.3, page 7-2, Bar 3, APV Level

The documentation matches the Bar 3 display. The displayed point value of SPDS0019 tracks the display.

NOTE: The displayed point value for SPDS0020 does not appear to track the Rate of Change digital display.

RECOMMENDED RESOLUTION of PROBLEM 14.

See RECOMMENDED RESOLUTION of PROBLEM 13.

Chapter 8 in Reference 1

PROBLEM 15.
15. Paragraph 8.1.1.1, page 8-2, Bar 1, AFRM

The documentation matches Bar 1 of the display. Point value for SPDS0008 does not correlate to the current value of the Bar 1 display. Point value for SPDS0009 changes every second. The current value of the Rate of Change changes every two seconds and matched every other displayed point value.

NOTE: The point value for SPDS0008 does not match the displayed current value of Bar 1.

RECOMMENDED RESOLUTION of PROBLEM 15.

See RECOMMENDED RESOLUTION of PROBLEM 13.

PROBLEM 16.
16. Paragraph 8.1.1.2, page 8-2, Bar 2, SRM

The documentation matches Bar 2 of the display. The point value for SPDS0013 does not match the Bar length in the display. The point value for SPDS0014 is in fair agreement with the displayed current value.

NOTE: The point value for SPDS0013 = -0.04/6000/green. The displayed Bar 2 length is 0.99. These two numbers should be equal.

RECOMMENDED RESOLUTION of PROBLEM 16.

This problem is covered under SSCR039. Per Lobner's notes dated 11/6/85, SAIC and NPPD is to monitor conformance of current value and bar/trend for SRM's. The problem is also covered in Lobner's notes, part 4 of II, item b.

PROBLEM 17.
17. Paragraph 8.1.3, page 8-4, Reactor Period

The reactor period point value SPDS0015 is sometimes the same as the displayed current value.

NOTE: The reactor period (SPDS0015) is a problem and it may be difficult to test this SPDS calculation. This point is calculated every second. Since the displayed period for the second(n) is actually calculated using second(n-1) values, to calculate the period requires a print out of the reactor period driving point values every second. In the Reactivity Control - Trend display the period is refreshed every three seconds. During the test it was not possible to display these values in a way that they could be hard copied. The attempts to extract the driving points and a value for the period yielded driving point numbers which when used to calculate a period did not match the displayed period. The period is also subject to wild fluctuations during constant or near constant reactor power operation.

RECOMMENDED RESOLUTION of PROBLEM 17.

SSER 062 documents this problem and per Lobner's notes, dated 11/6/85, part 1. of II, item b, the algorithm driving the period calculation will be revised.

Chapter 9 in Reference 1

18. Paragraph 9.8, page 9-42, RHR PUMP NPSH LIMITS

RHR LOOP A FLOW
The Y (SPDS0063) and the X (N004) values for this plot track the point values for each.

RHR LOOP B FLOW
The Y (SPDS0062) and the X (N005) values for this plot track the point values for each.

NOTE: The logic diagram for the NPSH Limit EOPSI is shown on Figure 9-18, page 9-47. The point values being input to this calculation do not give the results predicted by the logic shown in the diagram.

The first set of points have values of:
N000 = 7/DALM/green
N001 = -3/LRL/magenta
N004 = -1197/LRL/magenta
N005 = 2025/LALM/red

The first decision box checks the health of these points. Since two of the points are not healthy, the result of the check should be a NO from that box. The NO path leads to a magenta EOPSI box. Since the EOPSI (RPV WATER LEVEL) is red, the program logic is not correct.

The next two decision boxes check the health of SPDS0063 and the health of SPDS0045. Both are healthy which results in a yes from these two boxes. The next four boxes check to determine whether or not the point f(X,Y) is greater than the Limit Curves for the Core Spray and RHR pumps. The results from these decisions are a NO, which leads to the green EOPSI box. However, since the EOPSI is red, the logic again is questionable. Correcting the first logic error could eliminate this problem.

RECOMMENDED RESOLUTION of PROBLEM 18.

This problem is documented as SSCR034, and was discussed during the meeting at CNS. Per Lobner's notes, dated 11/6/85, part 1 of II, item c. SAIC will verify the software for the NPSH limit EOPSI.

Nebraska Public Power District

COOPER NUCLEAR STATION
P.O. BOX 98, BROWNVILLE, NEBRASKA 68321
TELEPHONE (402) 825-3811

SCIENCE APPLICATIONS INT'L
FILE #
LOGGED

CNSS855968

December 30, 1985

JAN

Mr. A. F. Lexa
Science Applications International Corporation
1204 Fenwick Drive
Lynchburg, Virginia 24502

Dear Tony:

Subject: Status of PMIS Error Reports, Change Requests, Etc.

Reference: Telephone Conversation Between Joe McClesky and Mike Culjat, December 16, 1985

On December 16th Joe McClesky contacted me and asked if I would send you a copy of all error reports and change requests written on the Plant Management Information System (PMIS) to date. Enclosed you will find the requested reports. This includes open and closed items as well as any supporting documentation we have available.

Items enclosed include:

Software Change Requests	-	SSCR001 thru SSCR063
Software Error Reports	-	SSER001 thru SSER133
Data Base Change Requests	-	SDBC001 thru SDBC066
Test Variance Reports	-	STVR001 thru STVR052
Data Change Requests	-	SDCR001 thru SDCR014
Software Move Requests	-	SSMR001 thru SSMR018
Hardware Problem Reports	-	SHPR001 thru SHPR005

A copy of these requests/reports is also being sent to Joe McClesky in Idaho Falls. If you have any further questions or concerns, please call.

Sincerely,

Michael T. Culjat

Michael T. Culjat
PMIS Administrator
Cooper Nuclear Station

SCIENCE APPLICATIONS INT'L
FILE #
LOGGED BY:

MTC:ya
Attachment

JAN 6 1986

cc: J. Murphy (w/o attach)

APPENDIX B

SUMMARY OF VALIDATION/FIELD INSTALLATION VERIFICATION REVIEWER COMMENTS AND DISCREPANCY REPORTS

SUMMARY OF VALIDATION/FIELD INSTALLATION VERIFICATION REVIEWER COMMENTS AND DISCREPANCY REPORTS

TECHNICAL ISSUE/PROBLEM	RC#	ORIG/ LAST ISSUE DATE	CURRENT STATUS	DR #	ORIG/ LAST ISSUE DATE	CURRENT STATUS	CNS PROBLEM REPORT #	ORIG/ APPROV ISSUE DATE	CURRENT STATUS	REFERENCE	NOTES
SYSTEM HEALTH MONITOR	21	7-19-85 1-6-86	OPEN	1	7-19-85 7-19-85	CLOSED					IMPORTANT FUNCTION SHOULD BE ADDED TO PMIS
DATA ACQUISITION SYS.	22	8-29-85 2-28-86	CLOSED	2	7-19-85 2-28-86	OPEN				SKINNER MEMO 1/29/86 HONKE-PAUL TELECON DATED 2/28/86	RECOMMENDED TESTING HAS NOT BEEN PERFORMED
CPU FAILOVER	-			3	7-19-85 2-28-86	CLOSED				SKINNER MEMO 1/29/86	TVR 4 FAT 35 DOCUMENTS TESTS
SPDS RATE TRANSFORM	3	2-20-85 5-3-85	CLOSED	4	7-19-85 1-6-86	CLOSED				SKINNER MEMO 10-1-85	DEVELOPERS ANSWERED QUESTIONS
SYSTEM LOAD TEST				5	7-19-85 1-6-86	OPEN					LOAD TEST SHOULD BE PERFORMED WITH PMIS IN FINAL CONFIGURATION
SCENARIO FILE CONTROL	1	2-20-85 7-19-85	OPEN	-	-	-	-				THIS IS A RECOMMENDED AUDIT RATHER THAN A TEST
SPDS DISPLAY LINKAGE	2	2-20-85 7-19-85	OPEN	-	-	-	-				IT IS RECOMMENDED THAT A HUMAN FACTORS REVIEW BE PERFORMED ON THE FINAL LINKAGE
SPDS REACTOR PERIOD UNITS	4	2-20-85 1-6-86	CLOSED	-	-	-	-				
LOG SIGNAL BAR DISPLAYS	5	2-20-85 1-6-86	OPEN	-	-		SSCR 39	9-5-85 11-8-85	CLOSED	JAPPD LETTER MURPHY TO SKINNER, DATED 11/25/85	BAR LENGTH PROBLEM REMAINS
SPDS WIDE RANGE REACTOR VESSEL LEVEL	6	2-20-85 1-6-86	OPEN		-	-	-				IT IS RECOMMENDED THAT A HUMAN FACTORS REVIEW BE PERFORMED ON THE NON-INSTRUMENTED LEVEL DISPLAY
IDT HARDCOPY CONTINUOUS BUSY	7	2-20-85 5-3-85	CLOSED	-	-	-	-				FAT TEST VARIANCE REPORT IS DOCUMENTED THIS PROBLEM AND SOLUTION

SUMMARY OF VALIDATION/FIELD INSTALLATION VERIFICATION REVIEWER COMMENTS AND DISCREPANCY REPORTS

TECHNICAL ISSUE/PROBLEM	RC#	ORIG/ LAST ISSUE DATE	CURRENT STATUS	DR #	ORIG/ LAST ISSUE DATE	CURRENT STATUS	CNS PROBLEM REPORT #	ORIG/ APPROV ISSUE DATE	CURRENT STATUS	REFERENCE	NOTES
SPDS UNDEFINED REGIONS ON CORE SPRAY PUMP & RHR PUMP NPSH LIMITS	8	2-20-85 1-6-86	OPEN	-	-	-				NPPD LETTER MURRAY TO SKINNER, DATED 11/25/85	
SECURITY SYSTEM	9	5-3-85 1-6-56	CLOSED	-	-	-					OPERATING EXPERIENCE INDICATES SECURITY SYSTEM IS OK
OPERATOR LOG	10	5-3-85 1-6-86	CLOSED	-	-	-					MINIMAL VALUE TO CARRY FURTHER
IS MIN. SCAN CLASS	11	5-3-85 1-6-86	CLOSED	-	-	-	SSER 70	8-26-85 9-18-85	CLOSED	LETTER TO LEIA 11-27-85. THIS ITEM HAS BEEN CLOSED	
DATABASE COMPARE UTILITY	12	5-3-85 1-6-86	CLOSED	-	-	-					MINIMAL VALUE TO CARRY
ALARM PROCESSING	13	5-3-85 7-19-85	OPEN	-							COULD BE INCLUDED IN LOAD TEST PER DR 5
ARCHIVAL STORAGE	14	5-3-85 7-19-85	OPEN	-							COULD BE INCLUDED IN LOAD TEST PER DR 5
QUICK LOOK FILE	15	5-3-85 1-6-86	CLOSED	-							TEST 56: POST TRIP LOG TEST - TESTED IN THE ARCHIVE FILE DATED: 1-7-85
SPDS DATA QUALITY	16	5-3-85 1-6-86	CLOSED	-						PPE LETTER TO MURPHY SAIC MEMO LORNER TO DIST. 11/7/85	CLOSED BASED ON TESTING BY PPE ON OCT. 3&4, 85'
SPDS XY PLOTS OFFSCALE	17	5-3-85 5-8-85	CLOSED	-							
MATH FUNCTIONS	18	5-3-85 1-6-86	OPEN	-							
RUNNING AVERAGE CALCULATION	19	5-3-85 7-19-85	OPEN	-							
DATA LINK TESTS	20	5-3-85 1-6-86	CLOSED								CLOSED BY V&V OBSERVATION

SUMMARY OF VALIDATION/FIELD INSTALLATION VERIFICATION REVIEWER COMMENTS AND DISCREPANCY REPORTS

TECHNICAL ISSUE/PROBLEM	RC#	ORIG/ LAST ISSUE DATE	CURRENT STATUS	DR #	ORIG/ LAST ISSUE DATE	CURRENT STATUS	CNS PROBLEM REPORT #	ORIG/ APPROV ISSUE DATE	CURRENT STATUS	REFERENCE	NOTES
REACTOR PERIOD	23	8-29-85 1-6-86	OPEN	-			SSER 62	8-26-85 11-26-85	CLOSED	PPE LETTER TO MURPHY 11-10-85 ATTACH B ITEM F SAIC MEMO LOBNER TO DIST. II.1.b 11/7/85	NEW ALGORITHM BEING INSTALLED
SPDS DISPLAY RESPONSE TIME	24	9-16-85 9-16-85	OPEN	-							
SPDS TIME PLOT OFFSCALE TRACKING	25	8-29-85 8-29-85	OPEN	-							
STATION PROBLEM REPORTS SUBMITTED BY V&V	26	9-16-85 1-6-86	OPEN	-			SDBC 20	9-5-85 11-8-85	CLOSED	NPPD LETTER CNL JAT TO LEIA DATED 12-30-85	CLOSURE OF SITE PROBLEM REPORTS WILL CLOSE THE RC.
							SDBC 21	9-5-85 12-4-85	CLOSED		
							SDBC 22	9-5-85 11-8-85	CLOSED		
							SSCR 33	9-5-85 11-8-85	CLOSED		
							SSCR 34	9-5-85 11-8-85	CLOSED		
							SSCR 35	9-5-85 11-8-85	CLOSED		
							SSCR 36	9-5-85	OPEN		
							SSCR 37	9-5-85	OPEN		
							SSCR 38	9-5-85 11-8-85	CLOSED		
							SSCR 40	9-5-85 12-3-85	CLOSED		

APPENDIX C

DISCREPANCY REPORTS

DISCREPANCY REPORT SERIAL NO.: 1 DATE: 7/19/85

PROJECT:
NPPD V&V

PREPARED BY: A. F. LEXA DATE: 7/19/85
SIGNATURE: A.F Lexa

V&V TASK:
SYSTEM VALIDATION

REVIEWED BY: N. C. THOMAS DATE: 7/19/85
SIGNATURE: NC Thomas

DOCUMENT(S) WHERE DISCREPANCY EXISTS:

PART 1

NEBRASKA TEST PROCEDURES, DOCUMENT NO. 501-8500102-02 FORWARDED BY SAIC MEMO PATE TO LEXA, 3/21/85

DESCRIPTION OF DISCREPANCY:

SYSTEM HEALTH MONITOR/SELF DIAGNOSTICS

NO SYSTEM TESTS WERE PERFORMED TO DEMONSTRATE THE SYSTEM HEALTH MONITOR OR THE ABLILTY OF THE SYSTEM TO SELF-DIAGNOSE AND ISOLATE DAS PROBLEMS. REFER TO DISCREPANCY REPORTS #5 (REQUIREMENTS VERIFICATION) AND #1 (DESIGN VERIFICATION

ESTIMATE OF IMPACT:

SYSTEM HEALTH MONITOR CALLED OUT IN OR 613 (NUREG-0835, SECTION 4.7.1) IS FOR DESIGN GUIDANCE. ADDITIONAL SAT TESTING IS RECOMMENDED TO TEST HEALTH MONITOR/ALARMS BY SIMULATION OF SYSTEM FAILURES.

RESOLUTION ACTION: (FROM SKINNER TO LEXA MEMO OF 6/14/85) PAGE 1 OF 2

PART 2

THE ABILITY TO SELF-DIAGNOSE AND ISOLATE DAC PROBLEMS WAS TESTED DURING FACTORY TEST. DURING FACTORY TEST THE FOLLOWING FUNCTIONS WERE DEMONSTRATED:

(1) LOSS OF COMMUNICATIONS TO DATA CONCENTRATOR CAUSING FAILOVER.

(2) QUALITY CODES OF BAD, INVALID, LOW REASONABLE, AND HIGH REASONABLE WERE ALL GENERATED DURING THE ANALOG INPUT TEST.

(CONTINUED ON NEXT PAGE)

ISSUED BY: JOHN SKINNER DATE: 6/14/85

DISCREPANCY RESOLVED

INITIAL	AFL			
POSITION	V&V PROGRAM MGR			
DATE	7/25/85			

COMMENTS: 7/19/85

PART 3

THIS DISCREPANCY IS CLOSED. THE ISSUE OF A SYSTEM HEALTH MONITOR IS ADDRESSED IN REVIEWER COMMENT 21. A REVIEWER COMMENT IS UTILIZED SINCE A SYSTEM HEALTH MONITOR FROM ORIGINATING REQUIREMENT OR 613 (NUREG-0835, PAGE 28), IS CONSIDERED DESIGN GUIDANCE RATHER THAN A REQUIREMENT.

DISCREPANCY REPORT	SERIAL NO.: 1	PAGE 2 OF 2	DATE: 7/19/85

PROJECT:	V&V TASK:
NPPD V&V	SYSTEM VALIDATION

DESCRIPTION OF DISCREPANCY: (CONTINUED)

(3) REFER TO 2.6.2.2 ERROR REPORTING OF FUNCTIONAL SPECIFICATION REV. B FOR ALL TYPES OF SYSTEM ERRORS THAT ARE RECORDED BY VAX/VMS.

DISCREPANCY REPORT SERIAL NO.: 2 DATE: 2/28/86

PROJECT:
NPPD V&V

PREPARED BY: A. F. LEXA DATE: 2/28/86
SIGNATURE: A.F. Lexa

V&V TASK:
SYSTEM VALIDATION

REVIEWED BY: N. C. THOMAS DATE: 2/28/86
SIGNATURE: N C Thomas

DOCUMENT(S) WHERE DISCREPANCY EXISTS:

(1) NEBRASKA TEST PROCEDURES, DOCUMENT NO. 501-8500102-02 FORWARDED BY SAIC MEMO DATE TO LEXA, 3/21/85

PART 1

DESCRIPTION OF DISCREPANCY: (CONTINUED ON PAGE 2) PAGE 1 OF 4

DATA ACQUISITION SYSTEM (Note this discrepancy report has been revised to reflect testing at CNS. Refer to Validation Test Report, dated 8/7/85 for original issue of discrepancy report. This report supercedes earlier issue.)

THE FACTORY ACCEPTANCE TESTING (FAT) OF THE DATA ACQUISITION SYSTEM (DAS) WAS CONSIDERED INADEQUATE BY THE V&V TEAM FOR THE FOLLOWING REASONS:

o THE HARDWARE CONFIGURATION OF THE DAS DURING FAT WAS NOT REPRESENTATIVE OF THE FINAL INSTALLATION.

ESTIMATE OF IMPACT:

A THOROUGH TEST OF THE DAS IN ITS FINAL CONFIGURATION IS CONSIDERED A REQUIREMENT.

PART 2

RESOLUTION ACTION: (FROM SKINNER TO LEXA MEMO OF 6/14/85) PAGE 1 OF 4

THE AVAILABILITY TEST WILL TEST THE SYSTEM WITH TOTAL DAS HARDWARE CONFIGURATION AND WILL SATISFY THIS DISCREPANCY.

DISAGREEMENTS TO DISCREPANCY REPORT #2

(1) SOE'S TESTED AT FAT. TEST 45 WAS NOT THE SOE TEST

(CONTINUED ON PAGE 3)

ISSUED BY: JOHN SKINNER DATE: 6/14/85

PART 3

DISCREPANCY RESOLVED: INITIAL

POSITION

DATE

COMMENTS: 2/28/86

IN RESPONSE TO THE DEVELOPERS' COMMENTS, THE V&V TEAM FEELS THAT THE UNTESTED SYSTEM CAPABILITIES SHOULD BE TESTED OR THE REQUIREMENTS WAIVED.

DISCREPANCY REPORT	SERIAL NO.: 2	PAGE 2 OF 4	DATE: 2/28/86

PROJECT: NPPD V&V

V&V TASK: SYSTEM VALIDATION

DESCRIPTION OF DISCREPANCY: (CONTINUED)

- o DAS SYSTEM FIRMWARE CHANGES WERE INSTALLED AFTER FAT TO MEET THE 10 SAMPLES PER SECOND REQUIREMENT.

- o NO TEST DOCUMENTATION WAS AVAILABLE TO SHOW THAT THE DAS MET A NUMBER OF SYSTEM REQUIREMENTS.

SUBSEQUENT TESTING OF THE SYSTEM AT CNS CONSISTED OF A REPEAT OF THE FAT TESTS PLUS A TEST OF THE 10 SAMPLES PER SECOND CAPABILITY. THIS TESTING DID TEST THE SYSTEM IN FINAL CONFIGURATION AND WITH FINAL FIRMWARE, HOWEVER, THE FOLLOWING ITEMS REMAIN OPEN:

1. TEST DATA FROM THE 10 SAMPLES PER SECOND TEST HAD SOME ANOMALIES. REFER TO RC #22.

2. THE V&V TEAM WAS UNABLE TO FIND DOCUMENTATION SHOWING THAT TEST 45 - PULSE INPUT POINT TEST - WAS CONDUCTED EITHER AT FAT OR AT CNS.

3. THE V&V TEAM WAS UNABLE TO FIND DOCUMENTATION SHOWING THAT THE FOLLOWING SYSTEM CAPABILITIES WERE TESTED:

SOW Paragraph	SR #	System Capability
4.2.1.4	152	Mux power fail response
4.2.1.8	154	VAX to data concentrator to mux time sync
4.2.7.5	165	Data concentrator performs operational diagnostics on mux. Data concentrator reports status to VAX.
4.2.7.6	166	Scan plan can be transmitted from data concentrator to VAX.
4.2.7.7	167	Data concentrator requires no attention during power fail - restart.
4.2.7.8	168	Data concentrator can turn off an alarm failed mux.
F-Spec Rev. B		
2.7	25	Load leveling algorithm
2.7.1	29	Open thermocouple detection

2/28/86
The following system capabilities remain untested:

SOW Paragraph	SR #	System Capability
4.2.1.4	152	Mux power fail response
4.2.7.5	165	Data concentrator performs operational diagnostics on mux.
4.2.7.6	166	Scan plan can be transmitted from data concentrator to VAX.
4.2.7.7	167	Data concentrator requires no attention during power fail - restart.
4.2.7.8	168	Data concentrator can turn off an alarm failed mux.
F-Spec Rev. B		
2.7.1	29	Open thermocouple detection.

DISCREPANCY REPORT	SERIAL NO.: 2	PAGE 3 OF 4	DATE: 2/28/86

PROJECT:
NPPD V&V

V&V TASK:
SYSTEM VALIDATION

RESOLUTION ACTION: (CONTINUED FROM PAGE 1)

(2) ONLINE FAULT ISOLATION AND ALARMING. THIS TEST WAS PERFORMED DURING FAILOVER AND ANALOG INPUT TESTING.

(3) THE SOE TIME TAG WAS GENERATED BY THE MUX WHICH IS SYNCHRONIZED WITH THE DATA CONCENTRATOR.

(4) FAT TEST 2 DEMONSTRATED SCAN PLAN DOWNLINE LOADED FROM VAX.

(5) ALL FAT FIELD INPUT TEST DEMONSTRATED SCAN PLAN CAN BE TRANSMITTED TO THE VAX (ANALOG, DIGITAL, ETC.)

(6) POWER FAIL-RESTART WAS VERIFIED AND DOCUMENTED DURING THE 100 HOUR TEST.

(7) THE PREPROCESSOR DOES NOT TURN OFF AN ALARM FAILED MUX. ALL POINTS ON A FAILED MUX ARE TAGGED WITH THE QUALITY CODE INVL.

(8) LOAD LEVELING ALGORITHM WAS TESTED DURING ANALOG FIELD INPUT TEST.

(From Skinner to Lexa memo of 1/29/86)

1. Refer to the attached (in 1/29/86 memo) Report of Compliance for test number E-3 and the closed TVR associated with the Report of Compliance.

2. Refer to enclosed (in 1/29/86 memo) Report of Compliance that certifies that Test 45 was run successfully.

3. o SDW paragraph 4.2.1.4 (SR#152) - This capability has not been tested.

   o SDW paragraph 4.2.1.8 (SR#154) - For scanned field input points, the time tag is standard VAX/VMS time plus a calculated delta value based on the time of the change of state that is sent to the host for each change of state. This time synchronization was demonstrated by SAIC during the SOE test and also by NPPD personnel who are testing scram timing which relies solely on SOE points.

   o SDW paragraph 4.2.7.5 (SR#165) - Although this function has not been formally tested, it has been observed on numerous occasions that when a multiplexor is powered down, all of the points connected through that MUX are tagged with a quality code of INVL.

   o SDW paragraph 4.2.7.6 (SR#166) - Although this capability has not been formally tested, the capability exists to allow the host to read the ASCII database from the data concentrator. This function was used extensively when the data concentrators were first received by SAIC.

   o SDW paragraph 4.2.7.7 (SR#167) - This function has not been formally tested, but has been demonstrated many times at CNS.

   o SDW paragraph 4.2.7.8 (SR#168) - The data concentrator does not turn off a failed multiplexor, but remains a status code for each point connected through that MUX to indicate a failure.

   o Functional Spec paragraph 2.7 (SR#25) - The load-leveling algorithm was not formally tested directly, but indirectly it can be shown to function properly. Consider the following:

DISCREPANCY REPORT	SERIAL NO.: 2	PAGE 4 OF 4	DATE: 2/28/86
PROJECT: NPPD	V&V TASK: SYSTEM VALIDATION		

RESOLUTION ACTION: (CONTINUED)

3. (Continued)

1. All points are being processed. This is apparent by observation at CNS.

2. All points are not being processed 10 times per second. If this were the case, the number of points processed per second would be much larger than it currently is. The AI test also demonstrated this fact (IE, one minute points were processed at one minute intervals).

3. If all points are not being processed 10 times per second, then the load is somehow distributed. The attached (in 1/29/86 memo) arrays were printed from global memory and shows how the different scan classes are divided up. Each processing cycle the point processor indexes into these arrays to determine which points to process.

- Functional Spec paragraph 2.7.1(SR#23) - Open thermocouple detection was not formally tested, but was informally tested at the factory prior to shipment. This function cannot be tested when running in parallel mode with the 4020.

DISCREPANCY REPORT SERIAL NO.: 3 DATE: 2/28/86

PROJECT:
NPPD V&V

PREPARED BY: A. F. LEXA DATE: 2/28/86
SIGNATURE: A. F. Lexa

V&V TASK:
SYSTEM VALIDATION

REVIEWED BY: N. C. THOMAS DATE: 2/28/86
SIGNATURE: N C Thomas

DOCUMENT(S) WHERE DISCREPANCY EXISTS:

P A R T 1

(1) NEBRASKA TEST PROCEDURES, DOCUMENT NO. 501-8500102-02 FORWARDED BY SAIC MEMO DATE TO LEXA, 3/21/85
(2) FUNCTIONAL SPECIFICATION - REV. B, SAIC DOCUMENT 501-8500109-2S, DATED 6/6/85

DESCRIPTION OF DISCREPANCY: (CONTINUED ON PAGE 2) PAGE 1 OF 2

FAILOVER TEST - FAT TEST 53 (Note this discrepancy report has been revised to reflect testing at CNS. Refer to Validation report, dated 8/7/85 for original issue of the discrepancy report. This report supercedes the earlier issue.)

REFERENCE (2), SECTION 2.13 SPECIFIES THE FOLLOWING FAILOVER PERFORMANCE:

- NO FAILOVER IS ATTEMPTED IF FAILOVER COMMAND IS GIVEN TO PRIMARY STANDALONE SYSTEM.

ESTIMATE OF IMPACT:

TESTING OF ALL POSSIBLE FAILOVER MODES IS CONSIDERED NECESSARY FOR THOROUGH SYSTEM TESTING. THIS WILL ENSURE HIGH SYSTEM AVAILABILITY DUE TO THE CRITICAL VALUE OF THE FAILOVER FUNCTION.

P A R T 2

RESOLUTION ACTION: (FROM SKINNER TO LEXA MEMO OF 6/14/85) PAGE 1 OF 2

THESE TESTS WERE DEMONSTRATED TO NPPD DURING SITE TESTS.

(From Skinner to Lexa memo of 1/23/86)

THESE FUNCTIONS WERE TESTED DURING FAT. REFER TO THE ATTACHED (IN 1/23/86 MEMO) TVR # FAT 15.

ISSUED BY: JOHN SKINNER DATE: 6/14/85

P A R T 3

DISCREPANCY RESOLVED : INITIAL: G. F.
POSITION: V&V Program MGR
DATE: 3/10/86

COMMENTS: 2/28/86

TVR # FAT 15 RESOLVED PROBLEM.

DISCREPANCY REPORT	SERIAL NO.: 3	PAGE 2 OF 2	DATE: 2/28/86

PROJECT:	V&V TASK:
NPPD V&V	SYSTEM VALIDATION

DESCRIPTION OF DISCREPANCY: (CONTINUED)

- NO FAILOVER IS ATTEMPTED IF FAILOVER COMMAND IS GIVEN TO BACKUP DURING INITIALIZATION OF PRIMARY.

THE V&V TEAM COULD FIND NO TEST DOCUMENTATION SHOWING THAT THESE CAPABILITIES WERE TESTED. FAT TEST 59, REFERENCE (2) DOES NOT INCLUDE THESE TESTS.

DISCREPANCY REPORT — SERIAL NO.: 4 — DATE: 1/6/86

PROJECT:
NPPD V&V

PREPARED BY: A. F. LEXA — DATE: 1/6/86
SIGNATURE: A.F. Lexa

V&V TASK:
SYSTEM VALIDATION

REVIEWED BY: N. C. THOMAS — DATE: 1/6/86
SIGNATURE: NC Thomas

PART 1

DOCUMENT(S) WHERE DISCREPANCY EXISTS:

(1) NEBRASKA TEST PROCEDURES, DOCUMENT NO. 501-8500102-02 FORWARDED BY SAIC MEMO PATE TO LEXA, 3/21/85

DESCRIPTION OF DISCREPANCY: — PAGE 1 OF 1

SPDS RATE TRANSFORM - FAT TEST 61

THE SPDS TEST DID NOT EXERCISE THE RATE TRANSFORM DUE TO THE TEST SIMULATOR ARRANGEMENT. IT IS RECOMMENDED THAT THE RATE TRANSFORM BE TESTED AT SAT WITH ANALOG TEST INPUT RAMPS AND THE FINAL DATA BASE TO VERIFY CORRECT OPERATION. THIS DISCREPANCY WAS PREVIOUSLY REVIEWER COMMENT #3, DATED 2/20/85.

ESTIMATE OF IMPACT:

ALTHOUGH THE RATE INFORMATION ON THE SPDS IS FOR OPERATOR INFORMATION, A THOROUGH TEST OF THE RATE CALCULATION IS CONSIDERED NECESSARY.

PART 2

RESOLUTION ACTION: (FROM SKINNER TO LEXA MEMO OF 6/14/85) — PAGE 1 OF 1

THIS TEST WAS WRITTEN AND PERFORMED DURING SITE TEST.

ISSUED BY: — DATE:

PART 3

DISCREPANCY RESOLVED | INITIAL | A.F.L | | | |
POSITION | V&V Program Mgr | | | |
DATE | 1/6/86 | | | |

COMMENTS: 7/19/85

RECOMMEND REEVALUATION BASED ON SITE TEST DATA.

1/6/86

A RATE TRANSFORM TEST WAS CONDUCTED AT CNS BY THE DEVELOPERS AND WAS QUESTIONED BY THE V&V TEAM. A MEMO SKINNER TO LEXA DATED 1/10/85 RESOLVED THE QUESTION. THIS DISCREPANCY IS CLOSED.

DISCREPANCY REPORT | SERIAL NO.: 5 | DATE: 1/6/86

PROJECT:
NPPD V&V

PREPARED BY: A. F. LEXA DATE: 1/6/86
SIGNATURE: A. F. Lexa

V&V TASK:
SYSTEM VALIDATION

REVIEWED BY: N. C. THOMAS DATE: 1/6/86
SIGNATURE: N C Thomas

PART 1

DOCUMENT(S) WHERE DISCREPANCY EXISTS:

(1) NEBRASKA TEST PROCEDURES, DOCUMENT NO. 501-8500102-02 FORWARDED BY SAIC MEMO PATE TO LEXA, 3/21/85

DESCRIPTION OF DISCREPANCY: (CONTINUED ON PAGE 2) PAGE 1 OF 3

LOAD TEST - FAT TEST 63

FAT TEST #63 DID NOT MEET THE SOW REQUIREMENT OF 45% SPARE CPU CAPACITY (OR 216). ALSO THE DATA ACQUISITION SYSTEM WAS DISABLED FOR THIS TEST WHICH CONTRADICTS THE TEST PLAN, SECTION 3.2, WHICH STATES "SIGNAL GENERATION EQUIPMENT WILL BE USED FOR SYSTEM LOAD TEST, ..."

IT IS RECOMMENDED THAT A MODIFIED VERSION OF FAT TEST 63 BE PERFORMED AT SAT UNDER THE FOLLOWING CONDITIONS:
1. FINAL DATABASE INSTALLED

ESTIMATE OF IMPACT:

THE V&V TEAM CONSIDERS THAT AN ACCURATE MEASURE OF SYSTEM PERFORMANCE UNDER REALISTIC HEAVY LOAD CONDITION IS NECESSARY.

PART 2

RESOLUTION ACTION: (FROM SKINNER TO LEXA MEMO OF 6/14/85) PAGE 1 OF 3

THE SOW INDICATED THIS TEST WILL NOT BE RUN AS PART OF SITE TESTING.

ISSUED BY: JOHN SKINNER DATE: 6/14/85

PART 3

DISCREPANCY RESOLVED | INITIAL | | | | |
POSITION | | | | |
DATE | | | | |

COMMENTS: 7/19/85 (CONTINUED ON PAGE 3)

THE V&V TEAM STILL CONSIDERS SOME FORM OF LOAD TEST SHOULD BE PERFORMED WITH THE SYSTEM IN THE FINAL CONFIGURATION.

DISCREPANCY REPORT	SERIAL NO.: 5	PAGE 2 OF 3	DATE: 1/6/86

PROJECT:	V&V TASK:
NPPD V&V	SYSTEM VALIDATION

DESCRIPTION OF DISCREPANCY: (CONTINUED)

2. CHALLENGE SYSTEM PER STEP 10 OF TEST 63
3. BEGIN TEST DURING PLANT UPSET CONDITIONS - E.G., REACTOR TRIP (IF POSSIBLE).

THE SYSTEM UTILIZATION AND CRT UPDATE RATES SHOULD BE MEASURED FOR THESE CONDITIONS.

DISCREPANCY REPORT	SERIAL NO.: 5	PAGE 3 OF 3	DATE: 1/6/86

PROJECT:
NPPD V&V

V&V TASK:
SYSTEM VALIDATION

COMMENTS: 1/6/86

THE V&V TEAM RECOMMENDS THAT THE PMIS SHOULD BE CONFIGURED IN A SELF MONITOR MODE TO ASSESS SYSTEM LOADING DURING PLANT TRANSIENTS. PARAMETERS SUCH AS CPU UTILIZATION, NUMBER OF ALARMS, NUMBER OF WRITES/READS TO DISC, NUMBER OF POINTS ARCHIVED, ETC. COULD BE ARCHIVED AND STUDIED FOR CONDITIONS SUCH AS PLANT TRIPS.

APPENDIX D

REVIEWER COMMENTS

REVIEWER'S COMMENT	SERIAL NO.: 1
PROJECT: NPPD V&V	DATE: 02/20/85 and 5/3/85 and 7/19/85
V&V TASK: VALIDATION TESTING	ISSUED BY: A. F. LEXA

TEST(S) UNDER REVIEW:

- All

QUESTION OR ANOMALY:

2/20/85

Scenario File Control

Many of the FAT tests use scenario files to drive certain test cases. The attached sheet lists the scenario files and also states in the note at the bottom of the page that these files will be placed under formal configuration management only <u>after</u> completion of the FAT.

Since test reproducibility is directly dependent upon the input data, the developers should describe how the above control is adequate. For example, what prevents someone from changing a scenario file after completion of a test but before the end of FAT?

5/3/85

To confirm test reproducibility a careful comparison between FAT and SAT should be made.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85.

All scenario files required SER form to be filled out during FAT. Formal site procedures have been written for SAT testing.

7/19/85 V&V TEAM COMMENT

It is still recommended that FAT and SAT results should be carefully compared.

FROM SUE WHITE (HSV) - 2/15

RCA1

Directory DULI:CNPPD.DATA

These are all of the scenario files currently used for testing.

BARTRN.SCE;2	BARTRN.SCE;1	DAVIDC.SCE;1	DIG.SCE;1
DIGITA.SCE;1	DYNELE.SCE;1	LEO.SCE;1	NEB211.SCE;1
NEB212.SCE;1	NEB221.SCE;1	NEB222.SCE;1	NEB231.SCE;1
NEB232.SCE;1	NEB241.SCE;1	NEB242.SCE;1	NEB243.SCE;1
NEB251.SCE;1	NEB301.SCE;1	NEB302.SCE;1	NEB303.SCE;1
NEB304.SCE;1	NEB305.SCE;1	NEB306.SCE;1	NEB307.SCE;1
NEB311.SCE;1	NEB315.SCE;1	NEB38C.SCE;1	NEB38R.SCE;1
NEB52A.SCE;1	NEB523.SCE;1	NEBTOP.SCE;1	NORMAL.SCE;1
PLHIST.SCE;1	PSEUDO.SCE;1	PSUCVT.SCE;1	QUICK.SCE;1
RPM.SCE;1	RWMSIM.SCE;1	SBI1.SCE;1	SBI2.SCE;1
SBI31.SCE;1	SBI32.SCE;1	SBI4.SCE;1	SBI5.SCE;1
SPDS.SCE;1	SPDS00.SCE;1	SPDS1.SCE;1	SPDS2.SCE;1
SPDS315.SCE;1	SYMBOL.SCE;1	TEST01.SCE;1	TEST02.SCE;6
TEST02.SCE;5	TEST02.SCE;4	TEST02.SCE;3	TEST02.SCE;2
TEST02.SCE;1	TEST03.SCE;3	TEST03.SCE;2	TEST03.SCE;1
TEST04.SCE;1	TEST05.SCE;4	TEST05.SCE;3	TEST05.SCE;2
TEST05.SCE;1	TEST06.SCE;2	TEST06.SCE;1	TEST07.SCE;2
TEST07.SCE;1	TEST09.SCE;1	TEST10.SCE;1	TEST11.SCE;6
TEST11.SCE;5	TEST11.SCE;4	TEST11.SCE;3	TEST11.SCE;2
TEST11.SCE;1	TEST16.SCE;1	TEST17.SCE;6	TEST17.SCE;5
TEST17.SCE;4	TEST17.SCE;3	TEST17.SCE;2	TEST17.SCE;1
TEST19.SCE;1	TEST20.SCE;1	TEST28.SCE;9	TEST28.SCE;8
TEST28.SCE;7	TEST28.SCE;6	TEST28.SCE;5	TEST28.SCE;4
TEST28.SCE;3	TEST28.SCE;2	TEST28.SCE;1	TEST30.SCE;3
TEST30.SCE;2	TEST30.SCE;1	TEST42.SCE;1	TEST43.SCE;2
TEST43.SCE;1	TEST44.SCE;3	TEST44.SCE;2	TEST44.SCE;1
TEST47.SCE;11	TEST47.SCE;10	TEST47.SCE;2	TEST47.SCE;1
TEST48.SCE;5	TEST48.SCE;4	TEST48.SCE;3	TEST48.SCE;2
TEST48.SCE;1	TEST49.SCE;1	TEST55.SCE;2	TEST55.SCE;1
TEST56.SCE;1	TEST57.SCE;1	TEST58.SCE;1	TESTHH.SCE;2
TESTHH.SCE;1	TESTLD.SCE;1	TREND8.SCE;1	TST001.SCE;1
TST17A.SCE;3	TST17A.SCE;2	TST17A.SCE;1	TST173.SCE;1
TST50A.SCE;1	TST50B.SCE;2	TST50B.SCE;1	TSTALL.SCE;1
TSTJL8.SCE;1	TSTSIM.SCE;1	WCVT.SCE;1	WORCV1.SCE;1
WORCV2.SCE;1	WORCV3.SCE;1	WORCVT.SCE;1	

Total of 139 files.

MMPIC.D is under CM control from this directory CNPPD.DATA1. It contains all of the point parameters. The scenario files are not under CM formal control but will be placed under control following Ship Test.

REVIEWER'S COMMENT	SERIAL NO.: 2
PROJECT: NPPD V&V	DATE: 02/20/85 and 7/19/85
V&V TASK: VALIDATION TESTING	ISSUED BY: A. F. LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

- FAT TEST #61 - SPDS

QUESTION OR ANOMALY:

SPDS Display Linkage -

The attached sheet provides the linkage map of the SPDS displays and how the up, down, right, left arrow function keys control the SPDS displays. From watching the SPDS test the following questions ar e:

1. Is there any plant operation logic behind the current display linkage? For example, is it better to go from the top level display directly to the RPV Water Level display rather than Reactivity Control Bar display?

2. It appears that the arrow function keys are somewhat clumsy to use. For example:

   - o Unless the attached sheet is available, the operator only has arrows indicating that some displays can be accessed. He has no way of knowing what displays.
   - o You can reach the end of a linkage chain where the only way out is to return to the menu.

   A human factors review of operation of these function keys is recommended.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85 V&V needs better understanding of display linkage. The two examples from item 2 are not true.

7/19/85 V&V TEAM COMMENT
This reviewer comment is a technical opinion based on witness of test procedure and thorough review of SPDS design documentation. Disposition is left to NPPD and the developer.

ENTER DISPLAY NAME OR FUNCTION KEY SPDSOVER:

14-FEB-1985
09:18:33

(PAGE 1 OF 1)

1

NEBTOP - PLANT OVERVIEW
NEB211 - REACTIVITY CONTROL - BAR
NEB212 - REACTIVITY CONTROL - TREND
NEB221 - RPV WATER LEVEL
NEB222 - CORE COOLING - TREND
NEB231 - COOLANT SYSTEM INTEGRITY - BAR
NEB232 - COOLANT SYSTEM INTEGRITY - TREND
NEB241 - CONTAINMENT INTEGRITY - BAR
NEB242 - CONTAINMENT INTEGRITY - TREND
NEB243 - SUPPRESSION CHAMBER MIMIC
NEB251 - RADIOACTIVE RELEASE - BAR
NEB52A - RADIOACTIVE RELEASE - TREND (PAGE 1 OF 2)
NEB52B - RADIOACTIVE RELEASE - TREND (PAGE 2 OF 2)
NEB301 - HEAT CAPACITY TEMPERATURE LIMIT
NEB302 - HEAT CAPACITY LEVEL LIMIT
NEB303 - SUPPRESSION POOL LOAD LIMIT
NEB304 - CONTAINMENT PRESSURE LIMITS
NEB305 - DRYWELL SPRAY INITIATION PRESSURE LIMIT
NEB306 - DRYWELL HYDROGEN AND OXYGEN STATUS
NEB307 - SUPRESSION CHAMBER HYDROGEN AND OXYGEN STATUS
NEB311 - RPV SATURATION TEMPERATURE LIMIT
NEB312 - MAXIMUM CORE UNCOVERY TIME LIMIT
NEB315 - RPV PRESSURE/LEVEL STATUS MATRIX
NEB38C - CORE SPRAY PUMP NPSH LIMITS
NEB38R - RHR PUMP NPSH LIMITS
EOP001 - EMERGENCY OPERATING PROCEDURES (PAGE 1 OF 3)
EOP002 - EMERGENCY OPERATING PROCEDURES (PAGE 2 OF 3)
EOP003 - EMERGENCY OPERATING PROCEDURES (PAGE 3 OF 3)
DYNELE - DEMONSTRATION OF DYNAMIC PROCESSOR
TEST - FACTORY TEST DEMONSTRATION
SAIPNS - PNIS PERFORMANCE MONITOR

CPU B

REACTIVITY | CORE COOLING | COOLANT SYSTEM INTEGRITY | CONTAINMENT INTEGRITY | RADIOACTIVE RELEASE

F1=CLEAR PREV CANC (↑ ↓) F2=EXIT MENU F3= HARDCOPY=BUSY F4= CONSOLE=PRIM/BAC F5= MODE=RUN F6= PLANT=NORMAL

REVIEWER'S COMMENT	SERIAL NO.: 3
PROJECT: NPPD V&V	DATE: 02/20/85 and 5/3/85
V&V TASK: VALIDATION TESTING	ISSUED BY: A. F. LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

- FAT TEST #61 - SPDS

QUESTION OR ANOMALY:

2/20/85
SPDS Rate Transform -

The SPDS test did not exercise the rate transform due to the test simulator arrangement. It is recommended that the rate transform be tested with analog test input ramps to verify correct operation.

COMMENTS:

5/3/85
Delete the RC - It was incorporated into discrepancy report #4.

REVIEWER'S COMMENT	SERIAL NO.: 4
PROJECT: NPPD V&V	DATE: 02/20/85 and 5/3/85 and 1/6/86
V&V TASK: VALIDATION TESTING	ISSUED BY: A. F. LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

- FAT TEST #61 - SPDS

QUESTION OR ANOMALY:

Reactor Period Units -

The units used for SRM period (on the Reactivity Control-Bar and Trend Displays) was expressed in Sec -1. This should be seconds. Both the display and design documents should be revised. See attached displays.

NOTE: During FAT the display was changed, however, no test variance report was issued. This comment should ensure complete resolution.

COMMENTS:

1/6/86 - Delete This Comment. Site tests confirmed correct units for reactor period.

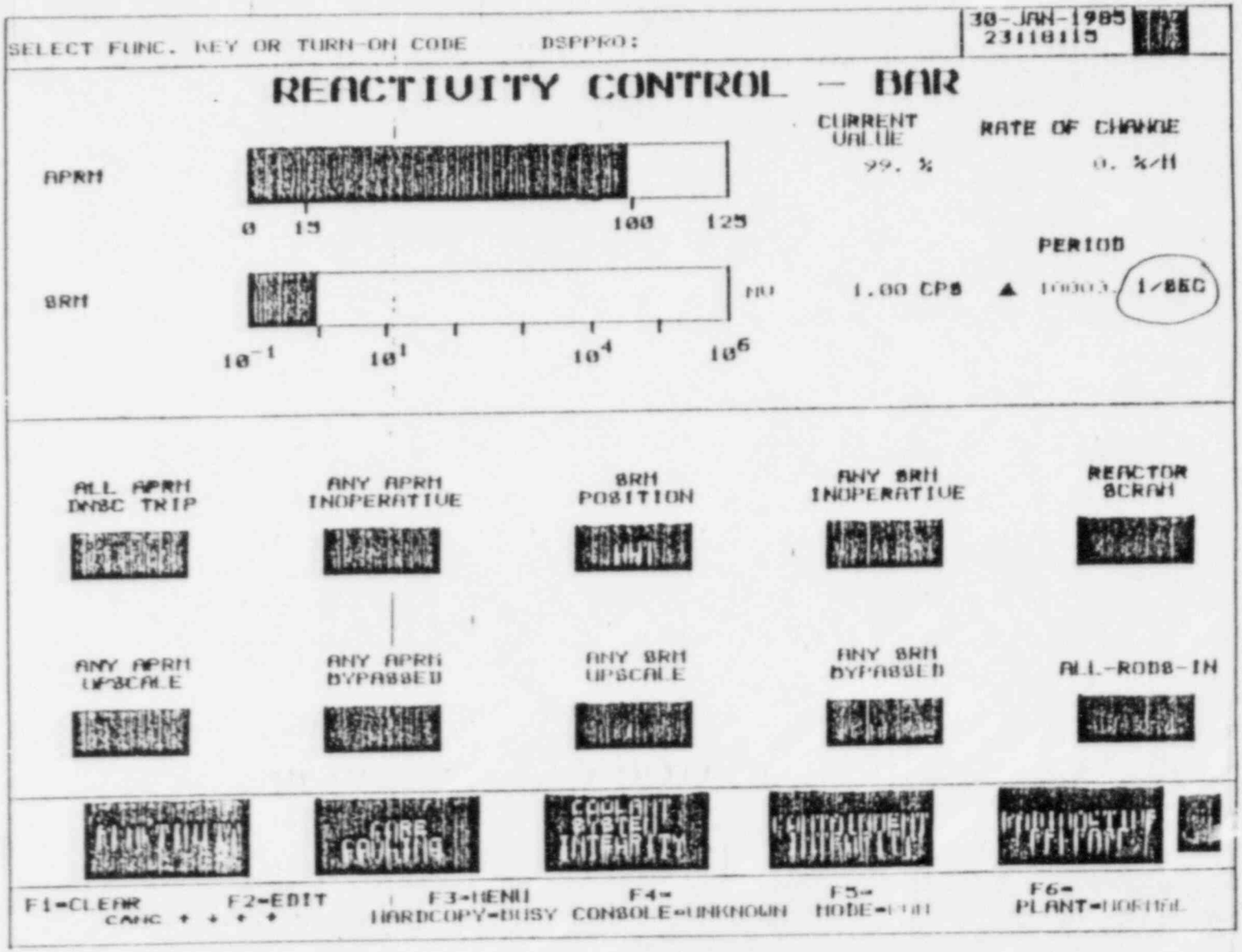


Figure 8-2. Display L2.1.1, Reactivity Control (Bar).

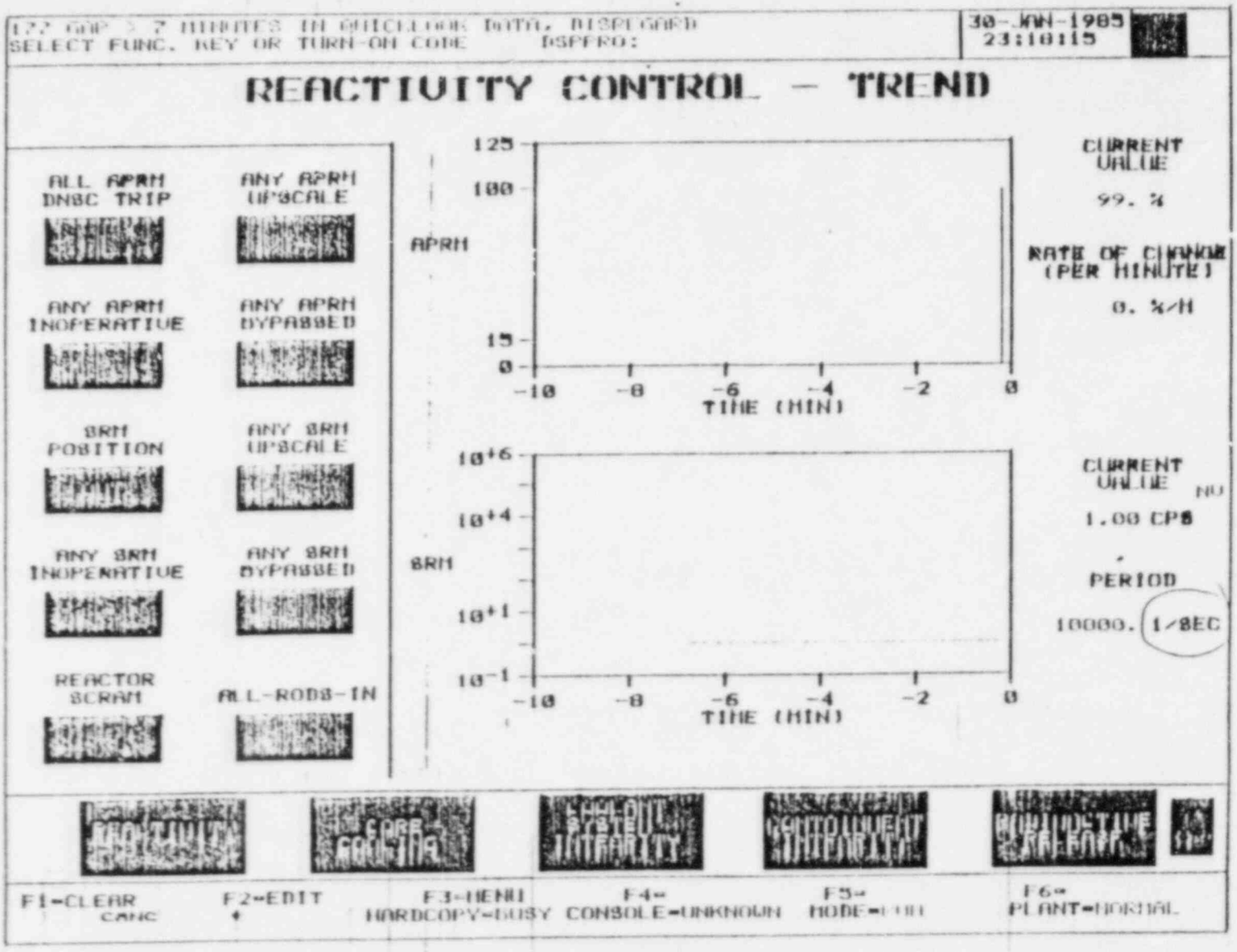


Figure 8-3. Display 12.1.2, Reactivity Control (Trend).

REVIEWER'S COMMENT	SERIAL NO.: 5
PROJECT: NPPD V&V	DATE: 02/20/85 and 8/29/85 and 1/6/86
V&V TASK: VALIDATION TESTING	ISSUED BY: A. F. LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

- FAT TEST #61 - SPDS

QUESTION OR ANOMALY:

Log Signal Bar Displays -

Because of the SPDS test limitations, logarithmic signals had test input values as if they were linear. This resulted in non-agreement in the digital values and bar displays - see attached example.

All log signals should be tested in a configuration to confirm agreement between the bar length and the numeric value. It is recommended that the tests be done using analog inputs.

COMMENTS: 8/29/85

During V&V witnessing of tests at CNS on 21 Aug. 85 the radioactive release-bar and trend displays were reviewed. The following problems exist:

1. For zero numeric values the bars and plots show 10 or 1. This is inconsistent and incorrect.

2. Since the value .0000E0 is meaningless on a logarithmic scale, offscale low should be shown by a value less than the low scale end or by some code such as DNSC.

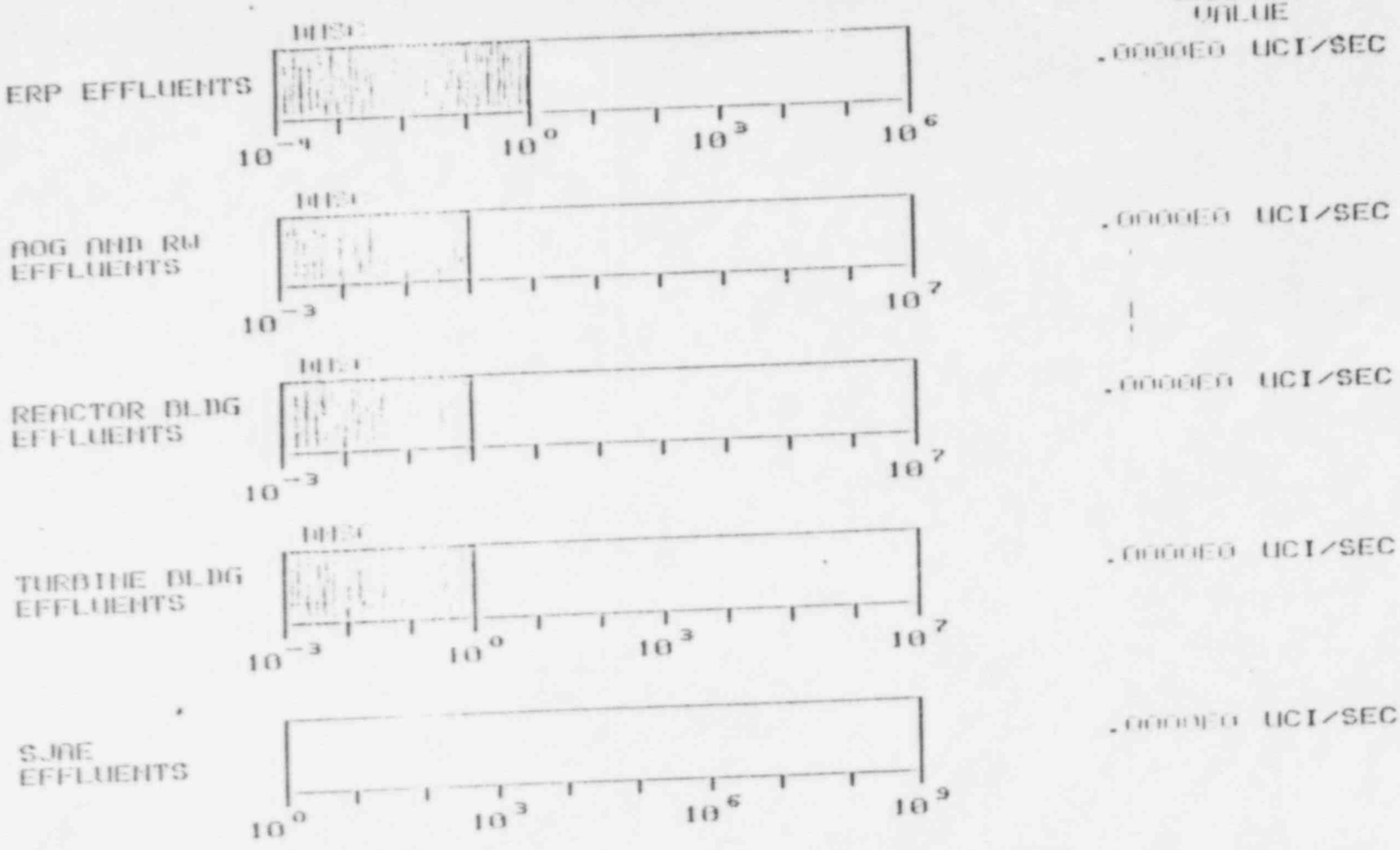
3. On the bar display SJAE has no color fill, however on the trend display turbine bldg effluents has no trace. Are SJAE effluents and turbine bldg effluents reversed?

1/6/86 V&V TEAM COMMENT

Close out of SSCR 039 has resolved problem of incorrect bar length for log signal when on scale. However, the attached display shows a problem with downscale indications. The digital value of .0E0 and the "DNSC" indication is OK, but the bar length is incorrect. The bar length indicates a value of 1 (1E0), not zero as shown in the digital display. A value of .0E0 should be represented with no bar color, indicating off scale low.

SELECT F 2. KEY OR TURN OFF CURR: SP1=29: 06

RADIOACTIVE RELEASE - BAR



F1=CLEAR CANC ↑ ↓ ← → F2= F3=MENU HARDCOPY=BUSY F4= CONSOLE=PRIMARY F5= MODE=REFUEL F6= EVENT=NORMAL

(enclosed in NPPD letter dated 11/25/85, Murphy to Skinner)

REVIEWER'S COMMENT	SERIAL NO.: 6
PROJECT: NPPD V&V	DATE: 02/20/85 and 1/6/86
V&V TASK: VALIDATION TESTING	ISSUED BY: A. F. LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

- FAT TEST #61 - SPDS

QUESTION OR ANOMALY:

Wide Range RPV Level -

The RPV water level display has provisions for a new wide range (200 to -100") instruments. The current display will provide an unchanging red bar level indication if the existing level instruments go off scale low. See attached display.

Displaying a water level bar not driven by live instrumentation could be confusing.

To avoid this confusion, it is recommended that no bar be shown until the new instruments are installed.

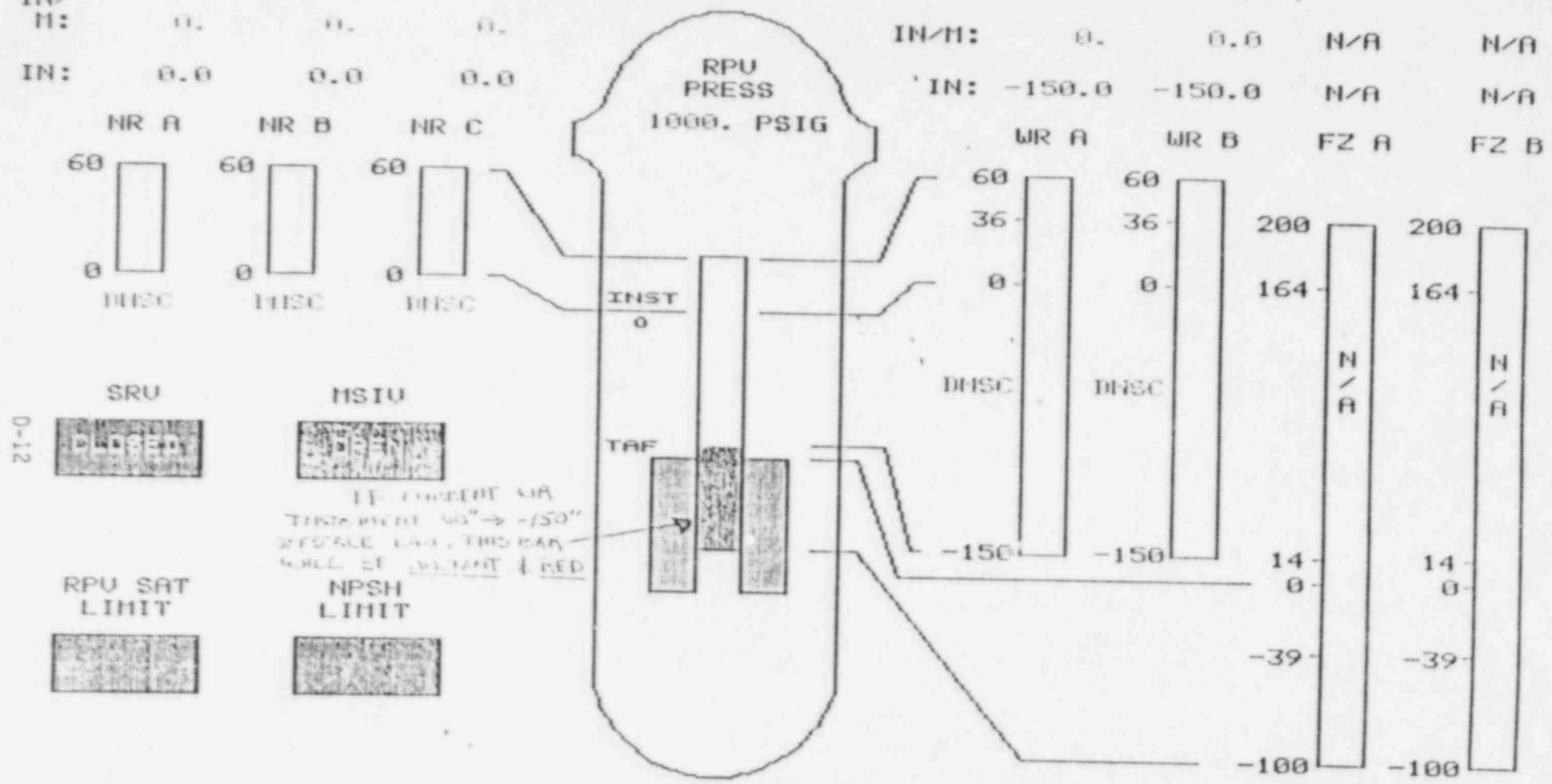
COMMENTS:

1/6/86 V&V TEAM COMMENTS

The V&V Team recommends a human factors review of the above concern. Disposition is left to NPPD and the developers.

RPU WATER LEVEL

(WATER LEVEL IN INCHES)



CPU B

REVIEWER'S COMMENT	SERIAL NO.: 7
PROJECT: NPPD V&V	DATE: 02/20/85 and 5/3/85
V&V TASK: VALIDATION TESTING	ISSUED BY: A. F. LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

- FAT TEST #61 - SPDS

QUESTION OR ANOMALY:

2/20/85
IDT Hardcopy Continuous Busy -

During SPDS test a hardcopy was requested before a previous request was completed. This caused a "lock up of the CRT" as being continuously busy.

Note - a previous problem report may have been issued.

COMMENTS:

5/3/85
TVR 15 written to handle problem. Delete this RC.

REVIEWER'S COMMENT	SERIAL NO.: 8
PROJECT: NPPD V&V	DATE: 02/20/85 and 1/6/86
V&V TASK: VALIDATION TESTING	ISSUED BY: A. F. LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

- FAT TEST #61 - SPDS

QUESTION OR ANOMALY:

Undefined Regions -

The Core Spray Pump NPSH Limits and RHR Pump NPSH Limits (attached) have undefined regions. The test procedures were confined to the defined regions only. Informal testing indicated that entry into the undefined regions were treated as limit violations (red).

The following is recommended:

1. The limits should be revised so that no undefined regions exist.

2. Testing should cover all regions.

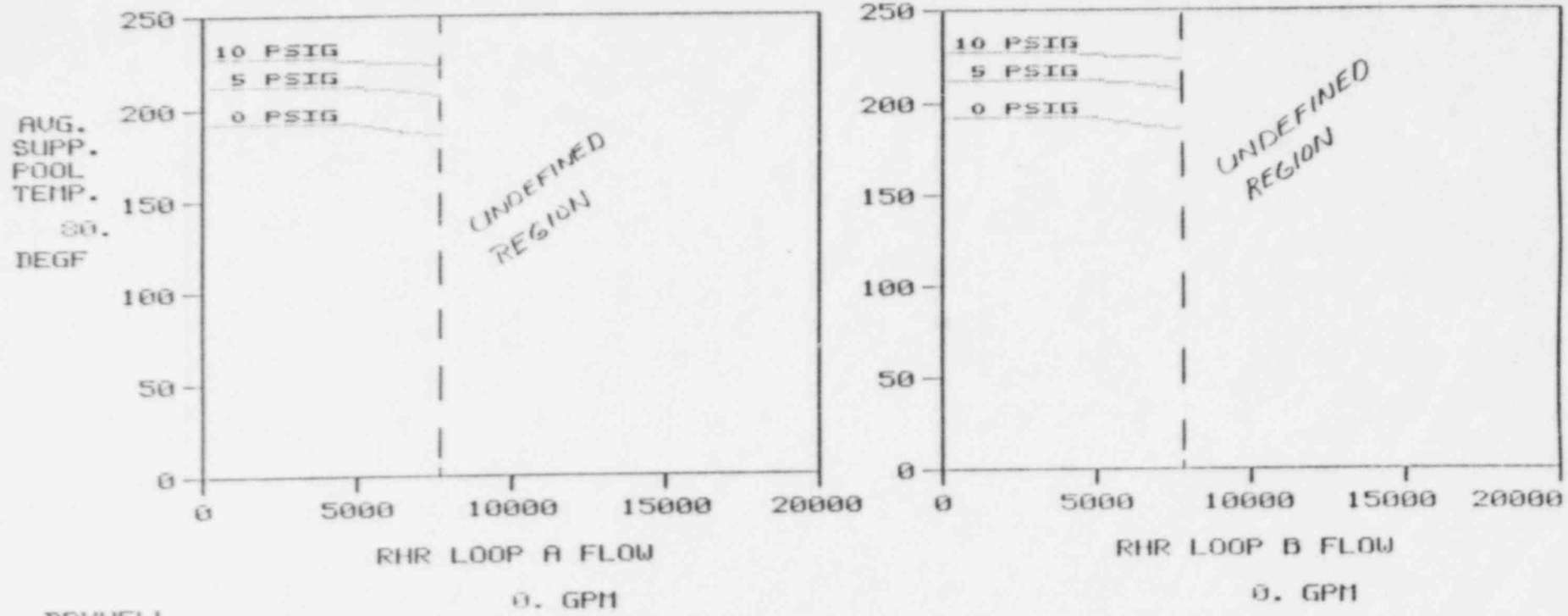
COMMENTS: 1/6/86 V&V TEAM COMMENT

Based on the NPPD letter Murphy to Skinner, dated 11/25/85, the NPSH limit curve displays will contain undefined regions where no limits are specified for a flow and temperature. Also, no limits are provided for two pump per loop operation. It is recommended that a human factor review be performed on the advisability of undefined NPSH limits.

Further it is recommended that the design of the NPSH Limit EOPSI (SPDS011B) be clarified and tested for the case when flow exceeds the end of the NPSH limit curve.

RHR PUMP NPSH LIMITS

(LIMIT CURVES APPLY ONLY TO SINGLE PUMP PER LOOP OPERATION)



D-15

DRYWELL PRESS. 5. PSIG

RHR PUMP 1A STATUS

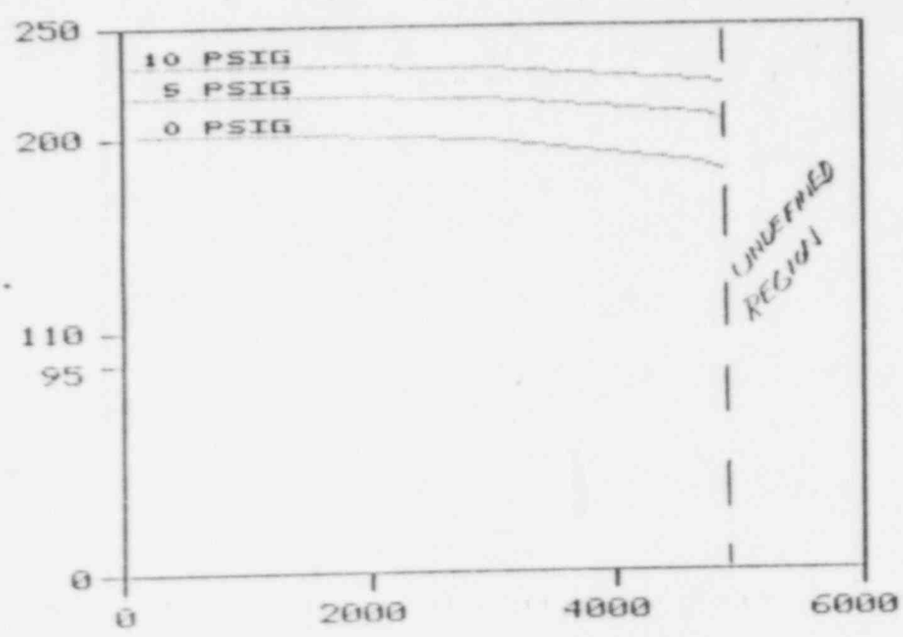
RHR PUMP 1C STATUS

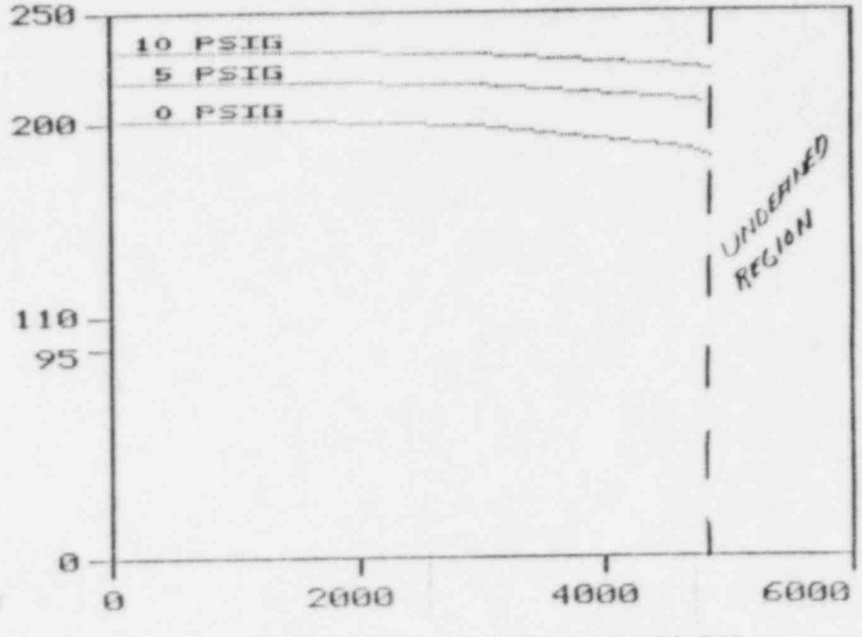
RHR PUMP 1B STATUS

RHR PUMP 1D STATUS

CPU B

CORE SPRAY PUMP NPSH LIMITS





0-16

DRYWELL PRESS.
5. PSIG

CS PUMP 1A STATUS
OFF

CS PUMP 1B STATUS
OFF

CPU B

REVIEWER'S COMMENT	SERIAL NO.: 9
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85 and 1/6/86
V&V TASK: SYSTEM VALIDATION	ISSUED BY: McCLESKEY/LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

QUESTION OR ANOMALY:

Security System

Although the FAT tests did challenge portions of the security system (eg: attempt action using invalid command), there was no systematic test that tested the main features of the security system. Recommended security system tests at SAT. Refer to System Design Verification DR #8.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85

The PMIS Security System was exercised during the Man-Machine Functions test (test 9) and the Database test.

7/19/85 V&V TEAM COMMENT

A Security System test is still recommended as part of SAT in order to test the security features of the system in its final configuration.

1/6/86 - V&V TEAM COMMENT - Delete This Comment.

V&V Team observations of security system at CNS indicate system is working satisfactorily.

REVIEWER'S COMMENT	SERIAL NO.: 10
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85 and 1/6/86
V&V TASK: SYSTEM VALIDATION	ISSUED BY: McCLESKEY/LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

- Test 9 - Man Machine Functions

QUESTION OR ANOMALY:

Operator Log

The capability that certain alarm messages are printed on the operator log was not tested. Specification the "5 minute no activity" and the "attempt to perform unauthorized function" messages were not tested for entry on the log. Recommended test when convenient.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85
This was tested during FAT test 9 Man-Machine Functions test.

7/19/85 V&V TEAM COMMENT
The test documentation of the FAT received by the V&V Team did not confirm that this capability was tested. Disposition is left to NPPD and the developer.

1/6/86 V&V TEAM COMMENT
Delete this comment. The referenced system capability is of minimal importance and need not be tracked further.

REVIEWER'S COMMENT	SERIAL NO.: 11
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85 and 1/6/86
V&V TASK: VALIDATION TESTING	ISSUED BY: McCLESKEY/LEXA

TEST(S) UNDER REVIEW:

(1) Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

(2) Functional Specification - Rev. A, SAIC Document 501-8500109-26, dated September 26, 1984.

QUESTION OR ANOMALY:

15 Minute Scan Rate

Factory acceptance test 27 and 40 did not test the 15 minute scan rate as specified in reference (2), section 2.7.5. It is recommended that the 15 minute scan rate be tested at SAT.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85
There is no 15 minute scan rate. This rate is for external points, such as meteorological points.

7/19/85 V&V TEAM COMMENT
Scan class H (15 min.) is specified in both REV. A and B of the Functional Specification and should be tested.

1/6/86 V&V TEAM COMMENT
Delete this comment. Per PPE letter to Lexa, dated 11/27/85, this problem was reported via SSER070 and was resolved on 9/18/85.

REVIEWER'S COMMENT	SERIAL NO.: 12
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85 and 1/6/86
V&V TASK: SYSTEM VALIDATION	ISSUED BY: McCLESKEY/LEXA

TEST(S) UNDER REVIEW:

Functional Specification - Rev. B, SAIC Document 501-8500109-26, dated 6/6/84.

QUESTION OR ANOMALY:

Database Compare

Section 2.8.4.3 of reference (1) specifies a data base compare utility. The FAT did not verify correct operation of this routine. Since this will be an important tool for configuration management, a functional validation is recommended at SAT.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85
This capability was demonstrated to Leo Parks in Huntsville. Ray Peterson also used this capability at Columbus.

7/19/85 V&V TEAM COMMENT
The V&V TEAM has no documentation to validate above described tests. This is an off line feature that is not directly involved with PMIS operation. Disposition is left to NPPD and the developer.

1/6/86 V&V TEAM COMMENT
Delete this comment. This off line capability has been successfully demonstrated.

REVIEWER'S COMMENT	SERIAL NO.: 13
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85
V&V TASK: SYSTEM VALIDATION	ISSUED BY: McCLESKEY/LEXA

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

QUESTION OR ANOMALY:

Alarm Processing

Tests for the following system capabilities could not be found in FAT test procedures:

1. Analog point initiate program if limit exceeded (FSpec section 2.9)

2. Alarm deadband for pseudo analog points. (FSpec section 2.9.2)

3. All alarms recorded on master alarm list (FSpec section 2.9.1)

These functions should be tested at SAT.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85 Alarm Test exercised the master alarm list. Agree with 1 and 2 above.

7/19/85 V&V TEAM COMMENT
Documentation available to V&V did not demonstrate any of the above items. Recommend tests at SAT.

REVIEWER'S COMMENT	SERIAL NO.: 14
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85
V&V TASK: SYSTEM VALIDATION	ISSUED BY: LEXA/PAUL

TEST(S) UNDER REVIEW:

(1) Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

(2) Functional Specification - Rev. A, SAIC Document 501-8500109-26, dated September 26, 1984.

QUESTION OR ANOMALY:

Archival Storage

FAT tests #49, 50 and 51 perform limited function test on the archival file. Since the operational archival file size is a function of the CNS data base and compression limit violation and alarm frequency, the SAT should provide tests to confirm:

1) archive storage capacity of 2 hours pre event and 12 hours post event data and 2 weeks magnetic tape.

2) data and alarm transaction time tagging at time of scan.

3) all alarm transactions are archived.

Note this test should be performed during plant upset conditions - e.g.: reactor trip.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85
Extensive testing was performed during FAT and SAT to test archive file during normal operations, during an event and during maximum system stress.

7/19/85 V&V TEAM COMMENT
SAT testing is still recommended to confirm archival file performance with final system configuration and database.

REVIEWER'S COMMENT	SERIAL NO.: 15
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85 and 1/6/86
V&V TASK: SYSTEM VALIDATION	ISSUED BY: McCLESKEY/LEXA

TEST(S) UNDER REVIEW:

(1) Functional Specification - Rev. B, SAIC Document 501-8500109-26, dated 6/6/84.

QUESTION OR ANOMALY:

Quick Look File

No FAT test could be found that tested the quick look function, section 2.10.1.1 of reference (1). Tests should be performed during SAT to validate its function.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85

SPDS Tests tested	Quick Look File
Post Trip tested	" " "
Event Recall tested	" " "

7/19/85 V&V TEAM COMMENT

The documentation to confirm tests of the Quick Look File could not be found. More specific references to test documents should be provided by the developers or demonstrated at SAT.

1/6/86 V&V TEAM COMMENT

Delete this comment. Review of test 56 - Post trip log test - indicates test of quick look file.

REVIEWER'S COMMENT	SERIAL NO.: 16
PROJECT: NPPD V&V	DATE: 5/3/85 and 1/6/86
V&V TASK: SYSTEM VALIDATION	ISSUED BY: J. H. McCLESKEY

TEST(S) UNDER REVIEW:

(1) Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

(2) Detailed Descriptions of the Displays for the Cooper Nuclear Station Safety Parameter Display System, SAIC Document 503-8500000-78, Revision 2, dated February 1, 1985.

QUESTION OR ANOMALY:

SPDS Data Quality Tests

The healthy calculations performed by the FAT SPDS testing, reference (1), did not exercise the calculation as described in Chapter 2 of the Detailed Descriptions of the Displays for the CNS SPDS, reference (2). In the FAT the input values were all changed together to drive the calculation to an unhealthy state. The input data set should be changed one at a time to a "poor" condition to see when a healthy calculation will change to an unhealthy result.

COMMENTS:

1/6/86 V&V TEAM COMMENT

Delete this comment. Based on PPE testing at CNS on 10/3, 4/85 refer to PPE letter to Murphy dated 10/20/85) and from the developer's problem resolution process (refer to SAIC Memo Lobner to Distribution dated 11/7/85), the V&V Team considers this comment resolved. Although the V&V Team did not witness the tests listed above, the SPDS problem recognition and resolution did not witness the tests listed above, the SPDS problem recognition and resolution process is effective and is resolving problems as they surface.

REVIEWER'S COMMENT	SERIAL NO.: 17
PROJECT: NPPD V&V	DATE: 5/3/85 and 5/8/85
V&V TASK: SYSTEM VALIDATION	ISSUED BY: McCLESKEY/LEXA

TEST(S) UNDER REVIEW:

(1) Detailed Descriptions of the Displays for the Cooper Nuclear Station Safety Parameter Display System, SAIC Document 503-8500000-78, Revision 2, dated February 1, 1985.

QUESTION OR ANOMALY:

SPDS X-Y PLOTS-OFFSCALE

Section 2.2.3 of reference (1) specifies that on SPDS, X-Y plots no "DNSC" indicator will be used. Rather the offscale condition will be indicated by a tracking cursor on the axis. This function was not tested at FAT and needs to be tested at SAT.

COMMENTS:

5/8/85

Delete this comment.

REVIEWER'S COMMENT	SERIAL NO.: 18
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85 and 1/6/86
V&V TASK: SYSTEM VALIDATION	ISSUED BY: J. H. McCLESKEY

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

QUESTION OR ANOMALY:

Test Procedure Checklist/Math Functions

The Statement of Work establishing that the SAIC QA procedures will be followed (page 2-49/paragraph 8.1). In Volume II of the SOW, Attachment 1, page K-9, a checklist for the test procedures in the SAIC QA procedures was not followed during the preparation of the test procedures.

For example, checklist item 7 states that "Is each input requirement tested for its range of inputs?"

In test 42: Pseudo analog processing test, the trig. and other math functions were tested for one input (or one set of input values) value.

The math functions should be retested over a range of values that are expected to be used on the VAX at CNS.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85
V&V has misinterpreted the SOW as it relates to Q.A. Procedures
Please call Bill Hullings for further clarification.

7/19/85 V&V TEAM COMMENT

The specific statement in question (referenced by the RC) in the SOW states that "SAI will implement quality assurance procedures to verify in each stage of the development that ... SAI will implement quality assurance procedures to validate the ... and to insure that all procedures are properly and completely followed." Whether or not the procedures are to be followed is not the main point of the RC. The product as tested has not been verified over the range of expected use. The testing performance addressed by this RC questions the fact that math functions were only tested at one point and not over the range of their expected use. For trig algorithms in particular, testing must be performed over several points of the function.

1/6/86 V&V TEAM COMMENT

It is recommended that the math functions be tested over range of use. The QA considerations is a moot point at this time.

REVIEWER'S COMMENT	SERIAL NO.: 19
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85
V&V TASK: VALIDATION TESTING	ISSUED BY: J. H. McCLESKEY

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

- FAT TEST #44, Transform Point Processing Test

QUESTION OR ANOMALY:

Running Average Calculation

The FAT test documentation for test 44 is insufficient in detail to evaluate the test results. For example, point ID test 451 is a 4 minute average. The value of this point changes to 74.9040 at 11:25:02. Point ID N006 is identified as the input to the test 451 calculation, which is assumed to be an arithmetic average. The special archive report shows the value of N006 for the 4 minutes prior to 11:25:02 to vary from 71.973 upward to about 100 and then down to 59.782. Paragraph 4.7.44.4 states that N006 is driven as a sine wave. The attached analysis for these conditions indicate that the arithmetic average should be close to 87. This test (number 44) should be run again. The expected results of the test should be calculated prior to running the test again.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85
The results of this test were verified by NPPD during FAT.

7/19/85 V&V TEAM COMMENT
The response to this RC does not address the problem. If the results of the math function testing were verified by NPPD during FAT, then this verification (documentation) should be sent to the V&V TEAM for review and resolution of the RC. RC to remain open.

BASIC PROGRAM SINE.ND1

McCloskey April 14, 1985

```
4 F2=0
5 F1=0
6 ZI=0
7 I=0
10 FOR Y=0! TO 20! STEP .1
15 X=Y/(2*3.14159)
20 Z=50*(1+ SIN(X))
25 IF Z>=71.904 THEN F1=1
26 IF F1=0 THEN 100
27 IF Z<59.782 THEN 180
30 ZI=ZI+Z
31 I=I+1
32 LPRINT Z
100 NEXT Y
180 LPRINT
181 LPRINT
190 LPRINT "TOTAL OF NUMBERS STARTING WITH Z>71.904"
191 LPRINT "GOING UP TO ABOUT Z=100 AND THEN BACK DOWN"
192 LPRINT "TO Z<59.782 = ";ZI
201 LPRINT
202 LPRINT
205 LPRINT "TOTAL NUMBERS ADDED TO GET ABOVE NUMBER = ";I
212 LPRINT
213 LPRINT
215 LPRINT "ARITHMETIC AVERAGE = ";ZI/I
230 END
```

SET VARIABLES & FLAGS

START LOOP

CALCULATE Z = f(SIN)

WHEN Z > 71.9 START CALCULATION OF $\bar{Z} = \sum \frac{Z_i}{I}$

IF Z < 71.9 SKIP TO NEXT Y

IF Z < 59.78 STOP COUNT

NEED FOR $\bar{Z}$ calc.

PRINT Z_i

LOOP STEP AT 0.1

72.26681	99.52107
72.97646	99.62541
73.68031	99.71634
74.37814	99.79469
75.0698	99.86042
75.75512	99.91353
76.43391	99.95399
77.106	99.98178
77.77123	99.99693
78.42943	99.99941
79.08043	99.98924
79.72405	99.96639
80.36016	99.93089
80.98856	99.88274
81.60911	99.82195
82.22166	99.74855
82.82606	99.66254
83.42214	99.56396
84.00975	99.45282
84.58874	99.32915
85.15898	99.19299
85.72031	99.04436
86.27258	98.88332
86.81568	98.70989
87.34945	98.52413
87.87376	98.32608
88.38847	98.11578
88.89346	97.89329
89.38859	97.65868
89.87376	97.41199
90.34882	97.15329
90.81366	96.88264
91.26818	96.60013
91.71221	96.30581
92.1457	95.99976
92.56852	95.68205
92.98054	95.35278
93.38168	95.01202
93.77182	94.65986
94.15089	94.29639
94.51878	93.92168
94.87538	93.53587
95.22061	93.13902
95.5544	92.73125
95.87665	92.31264
96.18727	91.88333
96.48619	91.44341
96.77334	90.99298
97.04864	90.53216
97.31204	90.06109
97.56343	89.57988
97.80278	89.08862
98.03003	88.58748
98.24512	88.07656
98.44798	87.55599
98.63856	87.0259
98.81682	86.48645
98.98272	85.93775
99.13623	85.37994
99.27728	84.81318
	84.2376
	83.65335
	83.06056
	82.45941
	81.85003

```
81.23258
80.60723
79.97413
79.33343
78.68529
78.0299
77.3674
76.69797
76.02178
75.33898
74.6498
73.95435
73.25283
72.54543
71.83231
71.11367
70.38968
69.66053
68.9264
68.18746
67.44392
66.69596
65.94378
65.18756
64.42749
63.66376
62.89657
[illegible]
60.5762
59.79712

TOTAL OF NUMBERS STARTING WITH Z>71.904
GOING UP TO ABOUT Z=100 AND THEN BACK DOWN
TO Z<59.782 =  13759.45

TOTAL NUMBERS ADDED TO GET ABOVE NUMBER =  157

ARITHMETIC AVERAGE =  87.63982

TOTAL OF NUMBERS STARTING WITH Z>71.904
GOING UP TO ABOUT Z=100 AND THEN BACK DOWN
TO Z<59.782 =  137360.9

TOTAL NUMBERS ADDED TO GET ABOVE NUMBER =  1566

ARITHMETIC AVERAGE =  87.71452
```

LOOP STEP AT 0.1

LOOP STEP AT 0.01

REVIEWER'S COMMENT	SERIAL NO.: 20
PROJECT: NPPD V&V	DATE: 5/3/85 and 7/19/85 and 1/6/86
V&V TASK: SYSTEM VALIDATION	ISSUED BY: J. H. McCLESKEY

TEST(S) UNDER REVIEW:

Nebraska Test Procedures, Document No. 501-8500102-02 forwarded by Pate to Lexa, memo dated 3/21/85

QUESTION OR ANOMALY:

Data Link Tests

The SOW, page 2-219, paragraph 7.3.1, establishes guidelines for the FAT. Some of these items were not included in the FAT.

For example, items (g) and (h), Simulation of Communication Channel Noise and Failure & Simulation of input noise conditions. The VAX data links to locations outside CNS should be tested to verify operation under field conditions.

COMMENTS: Developer's comment from Skinner to Lexa memo of 6/14/85
Availability Test will test operations under true field conditions.

7/19/85 V&V TEAM COMMENT
This RC addresses the guidelines established in the SOW for the Data Link Tests which were not included in the FAT. RC to remain open.

1/6/86 V&V TEAM COMMENT
Delete this comment. V&V Team observation of system operation in final configuration indicates satisfactory data transmission reliability.

REVIEWER'S COMMENT	SERIAL NO.: 21
PROJECT: NPPD V&V	DATE: 7/19/85 and 1/6/86
V&V TASK: SYSTEM VALIDATION	ISSUED BY: LEXA

TEST(S) UNDER REVIEW:

(1) Detailed Descriptions of the Displays for the Cooper Nuclear Station Safety Parameter Display System, SAIC Document 503-8500000-78, Revision 2, dated February 1, 1985

(2) SAIC Memo from Skinner to Lexa dated October 30, 1984

QUESTION OR ANOMALY:

System Health Monitor

Note: This RC addresses an issue previously addressed in DR#1 in the draft Validation Test Report. An RC was used since the issue is felt to be design guidance rather than a requirement.

The originating requirement for a system health monitor is taken from OR 613 (NUREG-0835, page 28) which discusses means to assess system health. Refer to RC #15 and DR #5 in Requirements Verification and RC #1 and DR #1 in Design Verification. The Developer's response to the requirements and design verification was provided in reference (2).

The V&V TEAM assessed system capability items 3 through 7 (from the capabilities matrix) as the system's Health Monitor. Although some tests were run to challenge the Health Monitor (eg - DCP data link failure), tests of system capabilities 3 through 7 were not conducted.

It is recommended that system capabilities 3 through 7 be tested.

COMMENTS:

1/6/86 V&V TEAM COMMENT

The V&V Team feels that a system health monitor as defined in NUREG-0835, Section 4.7.1, ("The control room operations staff shall be provided with sufficient information and criteria for performance of an operability evaluation of the SPDS"), should be incorporated into the PMIS. This is based on V&V observations of system operation at CNS when it is difficult to determine the SPDS operating status. For example, refer to SCCR 040.

Note that the health monitor defined above from NUREG-0835 is functionally different from the health monitor defined by the developers.

REVIEWER'S COMMENT | SERIAL NO.: 22

PROJECT: NPPD V&V | DATE: 8/29/85 AND 2/28/86

V&V TASK: VALIDATION/FIELD VERIFICATION TESTING | ISSUED BY: A. F. LEXA

TEST(S) UNDER REVIEW:

Site Test Results - Appendix E-7

QUESTION OR ANOMALY: 0.1 Sec Scan Test Data

Review of data from 0.1 sec scan rate revealed an occasional skip of a data point coupled with an apparent time skew. The attached plots illustrate the problem.

Our review indicated the following:

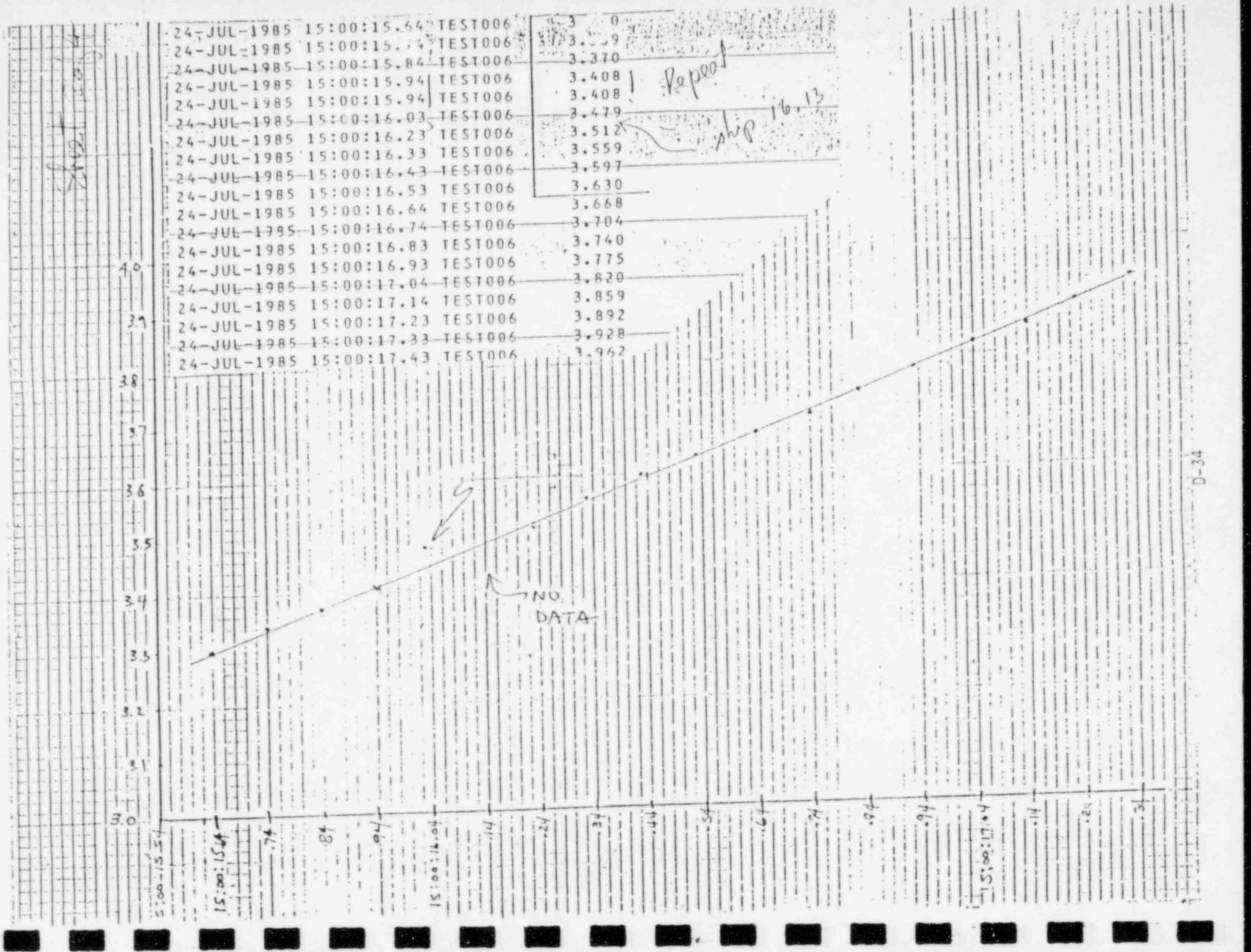
Test	Time	Problem
0000	N/A	no skips
0009	10:02:43.64	2 points missed
	10:02:54.55	2 points missed
002	10:16:31.42	1 point missed
006	10:20:01.32 through 10:20:06.52	15 points missed

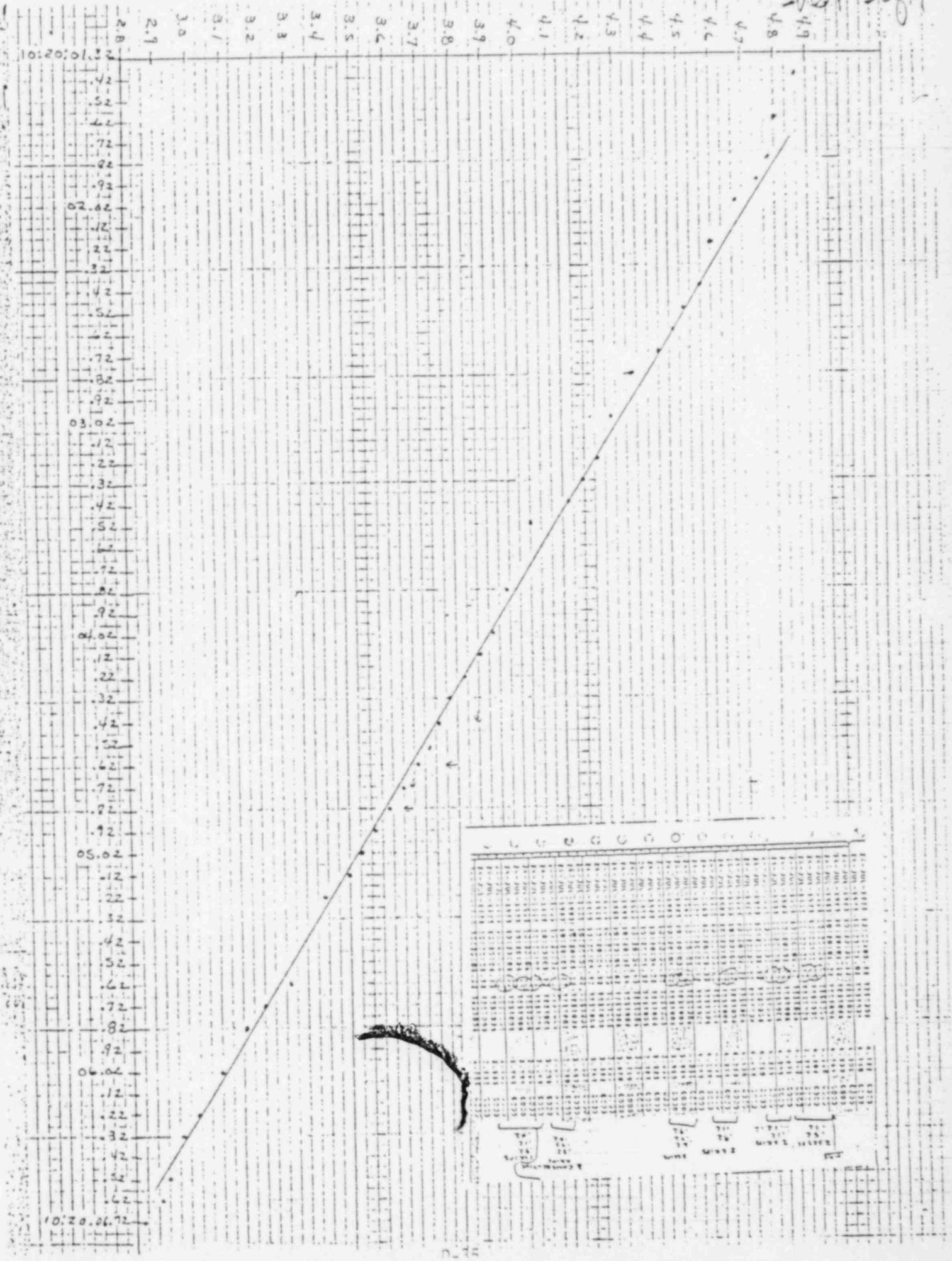
COMMENTS:

This phenomenon should be understood and corrected if possible.

2/28/86

TVR SAT 30 attached to 1/29/86 Skinner to Lexa memo documents resolution of problem.


24-JUL-1985 15:00:15.64 TEST006
24-JUL-1985 15:00:15.74 TEST006
24-JUL-1985 15:00:15.84 TEST006
24-JUL-1985 15:00:15.94 TEST006
24-JUL-1985 15:00:15.94 TEST006
24-JUL-1985 15:00:16.03 TEST006
24-JUL-1985 15:00:16.23 TEST006
24-JUL-1985 15:00:16.33 TEST006
24-JUL-1985 15:00:16.43 TEST006
24-JUL-1985 15:00:16.53 TEST006
24-JUL-1985 15:00:16.64 TEST006
24-JUL-1985 15:00:16.74 TEST006
24-JUL-1985 15:00:16.83 TEST006
24-JUL-1985 15:00:16.93 TEST006
24-JUL-1985 15:00:17.04 TEST006
24-JUL-1985 15:00:17.14 TEST006
24-JUL-1985 15:00:17.23 TEST006
24-JUL-1985 15:00:17.33 TEST006
24-JUL-1985 15:00:17.43 TEST006
3.370
3.408
3.408
3.479
3.512
3.559
3.597
3.630
3.668
3.704
3.740
3.775
3.820
3.859
3.892
3.928
3.962
Repeat
ship 16.13
NO DATA
4.0
3.9
3.8
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3.0
15:00:15.54
15:00:16.04
15:00:17.04
D-34


10:20:01.32
.42
.52
.62
.72
.82
.92
02.02
.12
.22
.32
.42
.52
.62
.72
.82
.92
03.02
.12
.22
.32
.42
.52
.62
.72
.82
.92
04.02
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.52
.62
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05.02
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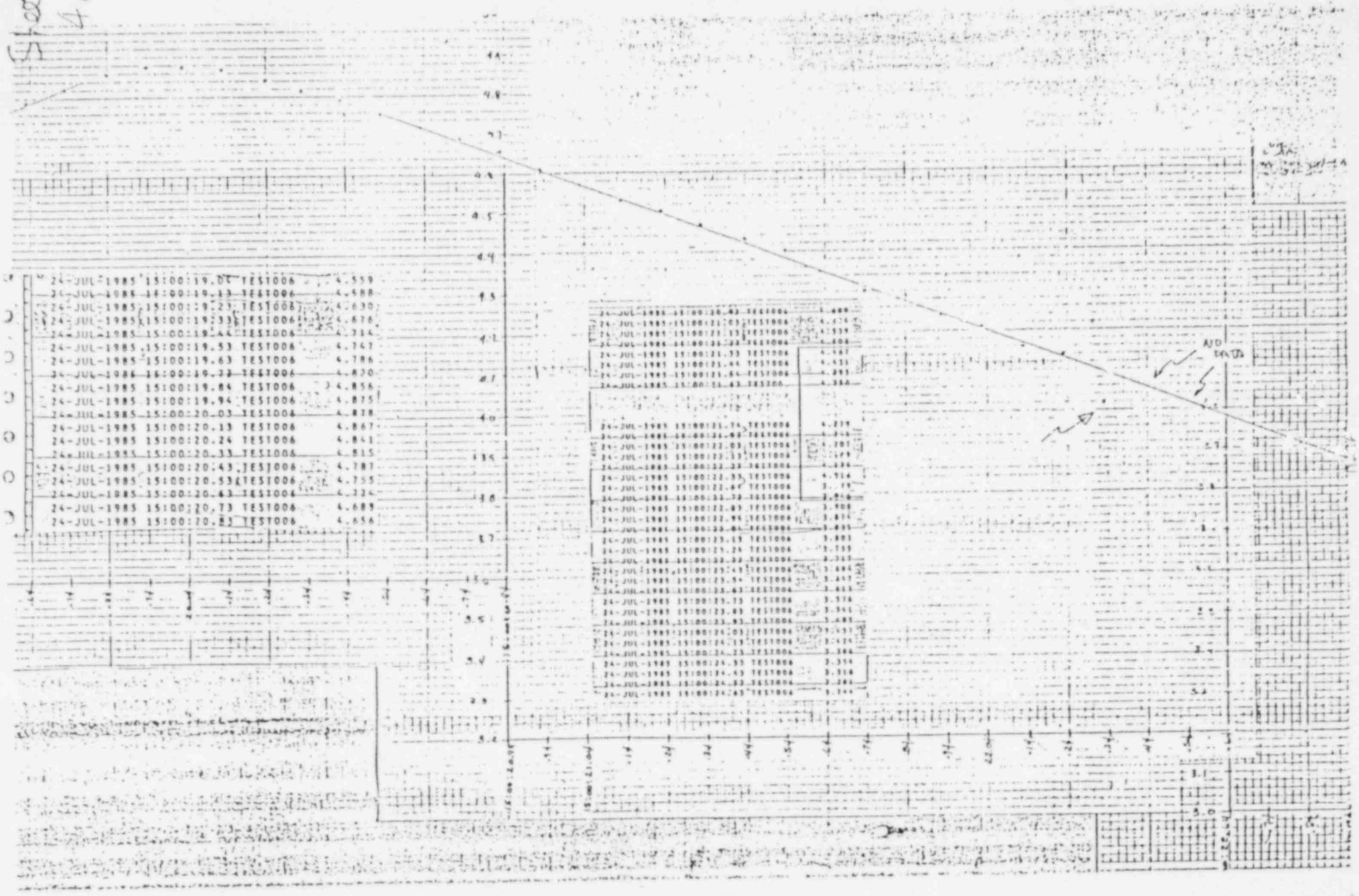
.92
06.02
.12
.22
.32
.42
.52
.62
10:20:06.72
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9

Sheet 4 of 4


24-JUL-1985 15:00:19.01 TEST006 4.559
24-JUL-1985 15:00:19.13 TEST006 4.588
24-JUL-1985 15:00:19.23 TEST006 4.630
24-JUL-1985 15:00:19.33 TEST006 4.676
24-JUL-1985 15:00:19.44 TEST006 4.714
24-JUL-1985 15:00:19.53 TEST006 4.747
24-JUL-1985 15:00:19.63 TEST006 4.786
24-JUL-1985 15:00:19.73 TEST006 4.830
24-JUL-1985 15:00:19.84 TEST006 4.856
24-JUL-1985 15:00:19.94 TEST006 4.875
24-JUL-1985 15:00:20.03 TEST006 4.878
24-JUL-1985 15:00:20.13 TEST006 4.867
24-JUL-1985 15:00:20.24 TEST006 4.841
24-JUL-1985 15:00:20.33 TEST006 4.815
24-JUL-1985 15:00:20.43 TEST006 4.787
24-JUL-1985 15:00:20.53 TEST006 4.755
24-JUL-1985 15:00:20.63 TEST006 4.726
24-JUL-1985 15:00:20.73 TEST006 4.689
24-JUL-1985 15:00:20.83 TEST006 4.656

REVIEWER'S COMMENT	SERIAL NO.: 23	Sheet 1 of 2
PROJECT: NPPD V&V	DATE: 8/29/85 and 1/6/86	
V&V TASK: VALIDATION/FIELD VERIFICATION TESTING	ISSUED BY: A. F. LEXA	

DOCUMENT(S) UNDER REVIEW:

SPDS Detailed Description, Rev. 2

2/1/85

QUESTION OR ANOMALY: Reactor Period

The above design document states:

"8.1.3 Calculation of External (Real) Data Point SPDS0015

The external calculation for point SPDS0015 uses the following algorithm to determine a rate-of-change of the average source range monitor (SRM) value (SPDS0014) in terms of reactor period:

$$\text{Period (sec}^{-1}\text{)} = \frac{26}{\text{Startup rate (decades/min)}}$$

In this algorithm, startup rate is a rate-of-change of the average SRM value (SPDS0014) in unites of decades per minute. The startup rate is calculated from the SRM rate-of-change derived from the SPDS rate-of-change transform (SPDS0087). This external (real) calculation assumes that point SPDS0087 has a processing frequency of once per second. If the processing frequency for point SPDS0087 is changed in the PMIS data base to any other value, the algorithm for SRM reactor period will compute an incorrect current value for reactor period."

During the V&V visit to CNS on 8/20, 21/85 plant conditions did not allow a complete test of this function. The following tests are recommended:

1) Insert a value for SPDS0014. A constant value should yield a startup rate of zero. What happens to reactor period (divide by zero?)

2) Check the scan rate for SPDS0087. Is it a 1 second scan? If not the algorithm won't work.

3) If possible a ramp for SPDS0014 should be inserted and the reactor period calculation checked.

COMMENTS: (SEE SHEET 2 OF 2)

REVIEWER'S COMMENT	SERIAL NO.: 23	Sheet 2 of 2
PROJECT: NPPD V&V	DATE: 8/29/85 and 1/6/86	
V&V TASK: VALIDATION/FIELD VERIFICATION TESTING	ISSUED BY: A. F. LEXA	

COMMENTS: (CONTINUED)

1/6/86 V&V TEAM COMMENT

Original algorithm for reactor period, described above, could not be validated by the V&V Team due to the inability to record the once per second values. However, per SAIC memo Lobner to Distribution, dated 11/7/85, a new reactor period algorithm is to be installed. This algorithm should be independently verified for correctness and noise susceptibility.

REVIEWER'S COMMENT | SERIAL NO.: 24

PROJECT: NPPD V&V | DATE: 09/16/85

V&V TASK: VALIDATION/FIELD VERIFICATION TESTING | ISSUED BY: J. H. McCLESKEY

DOCUMENT(S) UNDER REVIEW:

Statement of Work

QUESTION OR ANOMALY: SPDS Display Response Time

During the V&V visit to CNS 8/20 through 9/6, SPDS response times from one SPDS display to the next requested SPDS display were taking longer than the SOW specified time of 3 seconds. The minimum time measured by the V&V team was 5 seconds.

There were some cases where the measured times were ten seconds or longer. For example, when you start with the SPDS OVERVIEW display and use the arrow keys to page several displays away from the overview display, you must first use a function key for any other display then use the function key for the overview display to return to that display.

The other case is to request to see a point value. The cancel key must first be depressed before the next SPDS display can be requested.

The SPDS display response time does not meet the intent of the SOW, page 2-113. "Following the initiation of any SPDS display format request from the display console, it will take a maximum of three seconds to complete the screen update, both dynamic and static portions."

COMMENTS:

REVIEWER'S COMMENT	SERIAL NO.: 25
PROJECT: NPPD V&V	DATE: 8/29/85
V&V TASK: VALIDATION/FIELD VERIFICATION TESTING	ISSUED BY: A. F. LEXA

DOCUMENT(S) UNDER REVIEW:

SPDS Detailed Description - REv. 2

2/1/85

QUESTION OR ANOMALY: SPDS Time Plot Offscale Tracking

Page 2-21 of the above document states, "Downscale Indicators are not used in trend plots or x-y plots. In these types of displays, a moving cursor will track along one axis of the display during a down-scale condition."

During the V&V trip to CNS a number of SPDS trend plots did not meet the above requirement. An example is attached.

COMMENTS:

177 GAP > 7 MINUTES IN QUICKLOOK DATA, DISREGARD
SELECT FUNC. KEY OR TURN-ON CODE SPDSOVER:

21-AUG-1985
13:38:27

E

REACTIVITY CONTROL — TREND

ALL APRM DNSC TRIP

ANY APRM UPSCALE

ANY APRM INOPERATIVE

ANY APRM BYPASSED

SRM POSITION

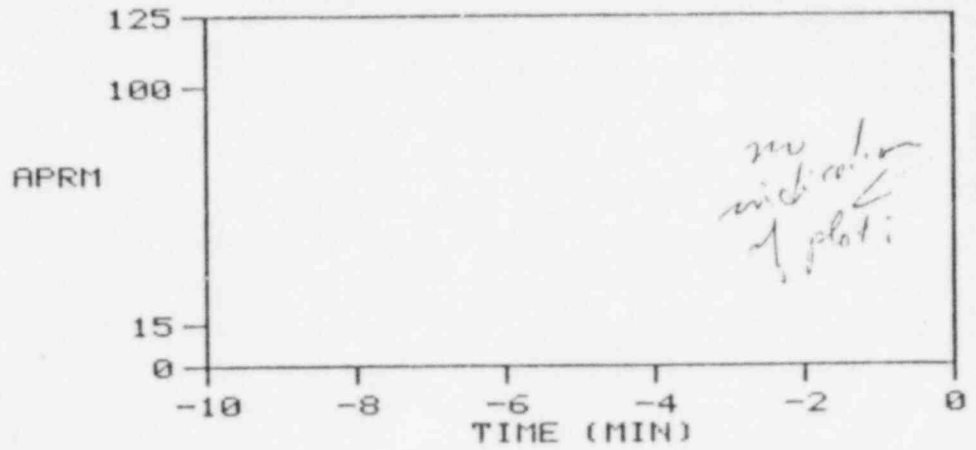
ANY SRM UPSCALE

ANY SRM INOPERATIVE

ANY SRM BYPASSED

REACTOR SCRAM

ALL-RODS-IN

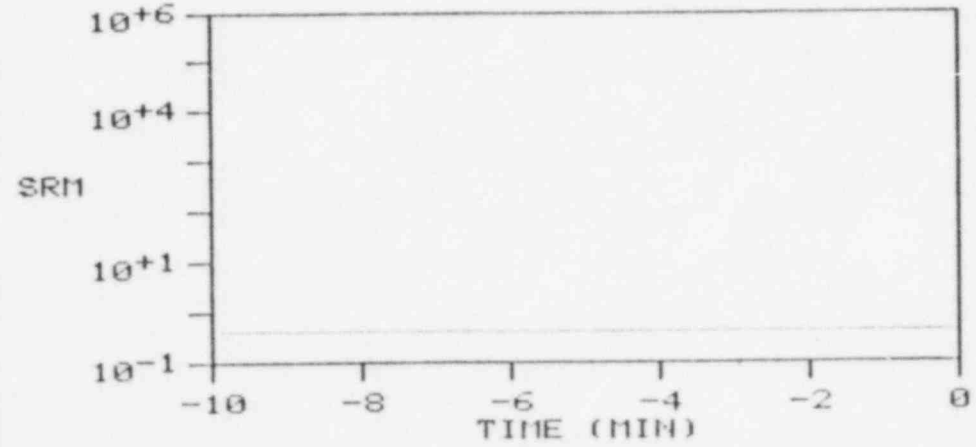


CURRENT VALUE

0. %

RATE OF CHANGE (PER MINUTE)

0. %/M



CURRENT VALUE

.4273E0 CPS

PERIOD

-10912. SEC

CORE COOLING

F1=CLEAR F2=EDIT F3=MENU F4= F5= F6=
CONSOLE=PRIMARY MODE= EVENT=STARTUP

REVIEWER'S COMMENT	SERIAL NO.: 26	Sheet 1 of 11
PROJECT: NPPD V&V	DATE: 9/16/85 and 1/6/86	
V&V TASK: VALIDATION/FIELD VERIFICATION TESTING	ISSUED BY: J. H. McCleskey	

DOCUMENT(S) UNDER REVIEW:

SPDS DETAILED DESCRIPTIONS DOC. NO. 503-8500000-78 (Rev. 2)

QUESTION OR ANOMALY: The following problem reports (CNS) were completed and submitted to Mike Culjat.

1. SDBC020 - SRM position ESI does not match documentation
2. SDBC021 - PointID's which have zero value and bad quality
3. SDBC022 - Point ID's which have a value of zero and quality of LRL
4. SSCR033 - Drywell sump ESI random Operation
5. SSCR034 - NPSH LIMIT EOPSI Box is wrong color
6. SSCR035 - Inability to change displays after requesting point ID display
7. SSCR036 - Inability to return to starting display after paging to other displays with function key
8. SSCR037 - CS PUMP status boxes wrong color
9. SSCR038 - Core cooling trend is NV with current inputs this is not correct
10. SSCR040 - PMIS hangup which allowed SPDS operation

1/6/86
Per NPPD letter, Culjat to Lexa dated 12/30/85 all problem reports except SSCR 36 and SSCR 37 have been resolved. When these are resolved the RC can be closed.

COMMENTS:

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

TITLE: DATA BASE CHANGE REQUEST USED FOR DATA BASE CHANGES (NPPDB::[NPPD.DATA]MMPIO.D)	DBC NO. SDBC 020

ORIGINATOR	PHONE	DATE	DIRECTORY/FILE NAME
McClesky	(208) 522 1265	09/05/85	[NPPD.DATA]MMPIO.D

DESCRIPTION OF REQUESTED CHANGE

The display criteria for the SRM POSITION ESI should be changed to meet the SPDS Display Description documentation (page 6-9). At Rx Power of 50% the ESI Box is RED/IN. SHOULD BE GREEN/OUT.

SAI/CM	DATE	STATUS

DISPOSITION

Permit A519 in data base changed. Alarm limit for mode 4 changed from 1 to ∅ (see also SDBC040)

S. Finn 11/7/85

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS
D.M. Pate M.T. Rufsal	11-8-85 11-8-85	

QA DATE	CM FILE

TITLE: DATA BASE CHANGE REQUEST USED FOR DATA BASE CHANGES (NPPDB::[NPPD.DATA]MMPIO.D)			DBC NO. SDBC021
ORIGINATOR McCloskey	PHONE (208) 522 1265	DATE 09/05/85	DIRECTORY/FILE NAME [NPPD.DATA]MMPIO.D

DESCRIPTION OF REQUESTED CHANGE

THE FOLLOWING POINT ID's HAVE A VALUE OF ZERO AND A QUALITY OF BAD; ~~M161, M162, M163~~, N082, N083 ~~DRYWELL TEMPERATURE~~

RAD MONITORS

These points have the wrong ADC code. Should 10 vice 8.

SAI/CM	DATE	STATUS

DISPOSITION

M161, M162 + M163 are not hooked-up. Therefor they are not a problem. N082 + N083 are set-up as 5th order polys. This is probably why they come up as "bad." Will check again after all bugs [illegible] have been corrected. Still reading bad on 12-4-85. Reset ADC code for N082 + N083 from 8 to 10. [illegible]

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS
A.D. Chandler, [illegible]	4-DEC-85 12-4-85	
QA		CM FILE
DATE		

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

TITLE: DATA BASE CHANGE REQUEST USED FOR DATA BASE CHANGES (NPPDB::[NPPD.DATA]MMPIO.D)	DBC NO. SDRC022

ORIGINATOR	PHONE	DATE	DIRECTORY/FILE NAME
M. Clesken	(208) 522 1265	09/05/85	[NPPD.DATA]MMPIO.D

DESCRIPTION OF REQUESTED CHANGE

The following points have a value of Zero and a Quality of LRL:

N061, N071, N079, N074, ~~[illegible]~~ BAD

RADIATION MONITORS

SAI/CM	DATE	STATUS

DISPOSITION

Points now have value of Ø, quality of GOOD

S. Finn 11/8/85

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS
[signature]	11-8-85	
[signature]	11-8-85	

QA	CM FILE
DATE	

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

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TITLE: SOFTWARE CHANGE REQUEST USED TO REQUEST SOFTWARE CHANGES			SCR NO. SSCR033
ORIGINATOR M. Clarkey	PHONE (209) 522-1265	DATE 09/05/85	DIRECTORY/MODULE/VERSI

DESCRIPTION OF REQUESTED CHANGE

THE DRYWELL SUMP ESI SEEMS TO RANDOMLY GO THROUGH THE COLORS GREEN MAGENTA AND RED, WITH ON OR OFF SHOWING. THIS CALCULATION SHOULD SHOW A GREEN BOX WITH THE PUMP ON OR OFF. IF THE WATER LEVEL IN THE SUMP GOES PAST AN UP SETPOINT AND THE PUMP FAILS TO TURN ON, THEN THE ESE BOX SHOULD BE RED/OFF.

SAI/CM	DATE	STATUS

DISPOSITION

The logic is setup as per what actually happens with plant. This is as it should be. It was running properly on 10-21-85

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS
Emp atc Mill Project	11-8-85 11-12-85	
GA DATE		CM FILE

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

TITLE: SOFTWARE CHANGE REQUEST USED TO REQUEST SOFTWARE CHANGES			SCR NO. SSCR034
ORIGINATOR	PHONE	DATE	DIRECTORY/MODULE/VERS
M Clarke	(208) 522 1265	09/05/85	

DESCRIPTION OF REQUESTED CHANGE

At Reactor Power ≈ 50%, the NPSH LIMIT EOPSI Box is RED. With the following inputs; N000 = 3/DALM/GREEN
N001 = -4/LRL/magenta
N004 = 1112/LALM/red
N005 = 1786/HALM/red According to page 9-47 of the SDS Display Description, the result of the first decision point should be N which leads to a magenta color for the EOPSI Box.

SAI/CM	DATE	STATUS

DISPOSITION

Software change made to routine SPCALZ.FOR. Revised file is in [NPAD.TEST]. Initial quality code used in the calculation had not been zeroed out from the previous calculation.

J. Finn 11/7/85

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS
D Mc Cabe	11-8-85	
[illegible]	11-8-85	
GA		CM FILE
DATE		

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

TITLE: SOFTWARE CHANGE REQUEST USED TO REQUEST SOFTWARE CHANGES			SCR NO. SSCR035
ORIGINATOR	PHONE	DATE	DIRECTORY/MODULE/VERS
M Gutesky	(208) 522-1265	09/05/85	

DESCRIPTION OF REQUESTED CHANGE

IF YOU REQUEST AN SPDS DISPLAY, THEN REQUEST A POINT ID DISPLAY, YOU CAN NOT REQUEST A SECOND SPDS DISPLAY UNTIL THE CANC KEY OR THE F1 KEY IS DEPRESSED.

SAI/CM	DATE	STATUS

DISPOSITION

This is the way it is supposed to work.

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS
[illegible]	11-8-85	
[illegible]	11-12-85	

QA	CM FILE
DATE	

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

TITLE: SOFTWARE CHANGE REQUEST USED TO REQUEST SOFTWARE CHANGES			SCR NO. SSCR036
ORIGINATOR	PHONE	DATE	DIRECTORY/MODULE/VERSI
M. Beskey	(208) 522 1205	09/05/85	

DESCRIPTION OF REQUESTED CHANGE

IF YOU PRESS THE SPDS OVERVIEW FUNCTION KEY, AND THEN USE THE ARROW KEYS TO PAGE TO A SECOND SPDS DISPLAY, YOU CAN NOT REQUEST THE SPDS OVERVIEW WITH THE RED FUNCTION KEY. THE TURN ON CODE FOR THE OVERVIEW DISPLAY ~~IS~~ (ANY STARTING DISPLAY) REMAINS THE CURRENT TURN ON CODE WHEN THE ARROW KEYS ARE USED. THE FASTEST WAY BACK TO THE OVERVIEW DISPLAY IS TO PRESS, (FOR EXAMPLE) THE RCAC FUNCTION KEY — THEN THE OVERVIEW DISPLAY KEY.

SAI/CM	DATE	STATUS

DISPOSITION

DMIS related, not SPDS.

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS

QA	CM FILE
DATE	

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

TITLE: SOFTWARE CHANGE REQUEST USED TO REQUEST SOFTWARE CHANGES			SCR NO. SSCR037
ORIGINATOR	PHONE	DATE	DIRECTORY/MODULE/VERS
M Clarkey	(208) 522 1265	09/05/85	

DESCRIPTION OF REQUESTED CHANGE

The CS PUMP 1A & 1B status boxes currently show ON/red with the reactor at 50% power and a small flow (CS pump) of 3 and -4 gpm. These boxes should be OFF/GREEN.

SAI/CM	DATE	STATUS

DISPOSITION

WILTed

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS

GA	CM FILE
DATE	

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

TITLE: SOFTWARE CHANGE REQUEST USED TO REQUEST SOFTWARE CHANGES			SCR NO. SSCR038
ORIGINATOR W.C. Chesley	PHONE (208) 522 1265	DATE 09/05/85	DIRECTORY/MODULE/VERS:

DESCRIPTION OF REQUESTED CHANGE The CORE COOLING TREND SPDS Display shows an NV for point ID SPDS0023. This point is calculated from G032 and G033 which are both failing the redundant check and are REDU/magenta. According to page 2-5 of Detailed Descriptions of the SPDS displays, REDU is healthy and should not be shown as NV.

SAI/CM	DATE	STATUS

DISPOSITION

Here points a failing on additional check to determine if they are healthy or not + that is why the NV is shown.

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS
[illegible]	11-8-85	
[illegible]	11-21-85	

GA	CM FILE
DATE	

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

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TITLE: DATA BASE CHANGE REQUEST USED FOR DATA BASE CHANGES (NPPDB::[NPPD.DATA]MMPIO.D)	DBC NO. SDBC040

ORIGINATOR	PHONE	DATE	DIRECTORY/FILE NAME
Steve Finn	(619) 458-2619	11/2/85	[NPPD.DATA]MMPIO.D

DESCRIPTION OF REQUESTED CHANGE

Data base changes requested at 11/6/85 meeting

SAI/CM	DATE	STATUS

DISPOSITION

1) Point SPDS0051 description changed from "CALCULATED DRYWELL TEMP." to "MAXIMUM DRYWELL TEMP."
2) Points SPDS0085 and SPDS0086 added alarm limits from modes 3 & 4 matching limits for modes 1 & 2 (see also SSER099)
3) A519 alarm limits for mode 1 changed to from 1 to 0. (see also SDBC020)
4) A533 alarm limits for all modes changed ~~to~~ from 1 to 0

S. Finn 11/7/85

APPROVED BY	DATE	AFFECTED FILES/DOCUMENTS
[illegible]	11-8-85	
[illegible]	11-9-85	

QA	CM FILE
DATE	

Validation Test Plan
For
Nebraska Public Power District

N. C. Thomas, SAIC
A. F. Lexa, SAIC
B. D. Paul, SAIC

March 15, 1985

SAIC-85/1567&264

Science Applications International Corporation
Post Office Box 4406, Lynchburg, Virginia 24502

RECORD OF REVISIONS

Date	Revision Number	Revision
01/28/85		Draft Issued
03/15/85		Formal Issue of Report

PAGE COUNT SUMMARY

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1. INTRODUCTION

This document is the Nebraska Public Power District (NPPD) Validation Test Plan. The purpose of the Validation Test Plan is to describe the approach for validation testing. The testing approach described herein has been tailored to fit the NPPD system as determined from the System Requirements and Design Verification. The scope of this Validation Test Plan includes the following:

1. PMIS hardware and software

2. NSSS or Core Performance Monitoring (CPM) software to be implemented in the PMIS. This includes the software that will interface to the existing Traversing Incore Probe (TIP) system.

3. The hardware and software for the Rod Worth Minimizer (RWM) and Rod Position Information System (RPIS) systems.

Since there are differences in the validation approach for each of the above areas, this document will present specific plan details as required. If no distinction is made, the discussion applies to all areas of validation testing.

1.1 Purpose of Validation Tests

The purpose of validation is to determine the correctness of the final Plant Management Information System (PMIS) (both hardware and software) with respect to the system requirements.

1.2 Summary of Test Requirements

The combination of testing performed by the developers and monitored by the V&V Team should meet the following requirements:

1.2.1 Testing Scope

The testing should be thorough enough to test all major system capabilities. The method used by the V&V Team to ensure this coverage is discussed in Section 2.3.

1.2.2 Documentation

Documentation of the test must be complete and controlled. This should include configuration management (CM) control over the system and test bed hardware and software, test procedures and test results. Also, measurable acceptance criteria should be provided.

1.2.3 Reproducible Results

Any test results should be fully reproducible. Non-reproducible results should be documented and explained, if possible, and resolved if necessary.

1.2.4 Test Scheduling

Tests should be scheduled to allow for a logical test sequence that tests the system functional blocks before integrated testing. Also, the test schedule should address how test failures will be handled - i.e., how much retesting is required and when can testing continue with a test failure. Finally, non-structured test time should be scheduled to allow for resolution of test failures and for probing questionable areas.

1.3 Reference Documents

1.3.1 NPPD PMIS CNS Statement of Work, Rev. 0, 10/7/83

1.3.2 NPPD PMIS CNS Functional Specification, Rev. A, 501-8500109-26, 9/26/84

1.3.3 NPPD PMIS CNS Detailed Design Volume I - Software, 502-8500110-01, 8/8/84

1.3.4 NPPD PMIS CNS Detailed Design Volume II - Interface, 502-8500110-02, 8/24/84

1.3.5 NPPD PMIS CNS Detailed Descriptions of the Displays for the Cooper Nuclear Station Safety Parameter Display System, 503-8500000-78, 7/20/84

1.3.6 NPPD PMIS CNS Safety Parameter Display System Safety Analysis, Rev. 0, 503-8500000-76, NRC Submittal, 3/1/84

1.3.7 System Requirements Verification Report for NPPD, SAIC-84/1739&264, 11/6/84

1.3.8 Software Design Verification Report for NPPD, SAIC-85/1509&264, 1/18/85

1.3.9 Hardware Design Verification Report for NPPD

1.3.10 Test Procedures & Results Non-1E DAS, 501-8500102-03, 7/9/84

1.3.11 Design & Installation Manual, 501-3500104-51

1.3.12 PMIS Maintenance Manual, 501-3500105-76

1.3.13 Equipment List, 502-3500108-51

1.3.14 PMIS Users Manual, 502-3500107-71

1.3.15 PMIS Operators Manual, 502-3500107-72

1.3.16 NPPD PMIS CNS Test Plan, 501-8500102-01, 10/20/84

1.3.17 Nebraska Test Procedures, 501-8500102-02, 1/7/85

1.3.18 Cooper Process Computer/Monicore Manual - Volume I - Operation and Maintenance Instructions, GEK-39470B, June 1984

1.3.19 Test Procedures for NSSS Software and Special Functions, (Note, tests will be conducted in three separate stages, refer to Section 1.5.3).

Note: The documents without dates have not have been submitted.

1.4 V&V Team Deliverable Documents for Validation Testing

The following documentation will be submitted as part of validation testing.

1.4.1 Validation Test Plan (This document)

1.4.2 Validation Test Report

- Evaluation of Developer's Test Plan (PMIS only, the NSSS, RPIS, RWM do not require a Test Plan because tests for the existing systems are to be used)
- Evaluation of Developer's Test Procedures
- Validation Test Log Form
- Reviewer Comments Form
- Discrepancy Reports
- Summary of Test Results.

Note: A Validation Test Report will be issued at the conclusion of the factory acceptance test (FAT). It is anticipated that during the FAT the following will be tested:

- The majority of the PMIS hardware and software
- Portions of the RWM and RPIS hardware and software
- Portions of the NSSS software.

The portions of the above systems not tested will require testing installed at Cooper Nuclear Station (CNS). Following these tests, another Validation Test Report will be issued.

1.5 Validation Test Philosophy

To ensure compliance with design requirements, system testing is always necessary. Even with the best design review and control systems, there will always be hidden faults that are only discovered during testing. The problem to be solved is how much and what kind of testing should be performed.

The process of validation addresses the above problem through systematic evaluation of both requirements and design documentation. Knowledge of the system requirements and design is used to ensure that all system features are tested and tested in a manner to minimize testing time and procedures. Design evaluation tools, such as the capability matrix, are used for this purpose.

For the NPPD system, the following specific validation test philosophy will be utilized:

1.5.1 PMIS Emphasis on SPDS

PMIS validation testing concentrates primarily on the SPDS and other emergency response system functions. This will be done because this is the primary area of concern with respect to the safety status of the plant and the operator's opportunity to respond to emergency conditions. This is the area of primary concern to the NRC. Also, due to the structure of the PMIS, a thorough test of the SPDS functions will exercise a large portion of the PMIS.

1.5.2 NSSS and S/F Emphasis on Testing

Validation testing for NSSS software and Special Functions (S/F) will emphasize testing. The usual validation step of developing tests based on requirements and design documentation is unnecessary since the NSSS software and S/F are not being designed. These systems have worked satisfactorily at CNS, only limited design verification is necessary. Rather, validation testing will concentrate on ensuring that the new implementation of these proven systems are accomplished without introducing any problems. This will be accomplished by executing the same tests used by the developer of the original systems, where possible. Also, during parallel operation both the

old and new implementation of same system will be compared as part of validation testing. Refer to Section 1.5.4.

1.5.3 Full Utilization of Developer Testing

A valid, well designed system test performed by the developer does not need to be repeated by the V&V Team. The V&V Team will recommend additional testing only when it is felt the developer's tests were incomplete or deficient. This approach is economical from a schedule and resource standpoint.

1.5.4 Validation Testing Schedule

Because of the NPPD schedule and the lack of the ability to fully test some functions at the factory, validation testing will be performed in different phases at different locations. The current testing plan is shown below:

System/Function	Test Location	Testing Type/Phase
PMIS-H/W & S/W	Huntsville/CNS	FAT - Developers Tests Validation Test
NSSS S/W Non-Converted	Huntsville/CNS	FAT - Developers Tests Validation Tests - (Ensure GE Static Test Cases Run Successfully)
NSSS S/W Converted (OD1, OD2, OD18, SR1-A, P6) (TIP included)	CNS	Developers Parallel* & Post Parallel* Tests Validation Tests During Parallel Operation (Ensure GE Test Cases Run Successfully)
Special Functions RWM & RPIS H/W & S/W	CNS	Developers Parallel* & Post Parallel Tests Validation Tests During Parallel Testing (Ensure New System And Old System Provide Same Results/ Functions)

Parallel = Simultaneous Operation of Function or System on Both the 4020 and VAX

Post Parallel = Operation of PMIS by itself (4020 decommissioned)

2. VALIDATION TEST APPROACH

2.1 Identification of Validation Testing Activities

Figure 2-1 is a VVID diagram of validation testing which describes six basic steps. Each step will be generally discussed below. Specific validation procedures will be provided in Section 3.0.

2.1.1 Review Developer's Test Plan and Procedures (Task 1)

In this step, the V&V Team will evaluate the test plan and procedures for completeness and for correct methodology. The testing should be closely linked to the design documents to ensure that all major system capabilities are tested. Also, the test methodology will be evaluated for correct test sequences, documentation, QA and documentation. A preliminary evaluation will be issued before the factory acceptance test begins. A formal evaluation will also be issued.

2.1.2 Monitor Factory Tests and Evaluate Results (Task 2)

The V&V Team will monitor the factory tests. The basic goal of the V&V Team will be to observe system performance compared to test procedures, system requirements, design documents and system capabilities. The V&V Team observer is independent from the test team. There is no requirement for full-time V&V Team participation in the tests or V&V sign-off on test procedures. If the V&V Team observer considers the system performance is questionable, a reviewer comment form will be used to document the concern. The concern may be resolved by additional testing either during factory testing or at some time later. The V&V Team realizes that factory testing can be a time of severe schedule constraints, because of this, any decision to retest will be made by the NPPD representative and the developer test leader.

2.1.3 Define Additional Test Requirements (Task 3)

This task will be performed after completion of the factory tests and all test results are made available to the V&V Team. The V&V Team will evaluate the test data and recommend any additional tests that are felt to be necessary. These tests will be in addition to any test recommended during factory testing. The performance of these tests will most probably be performed at CNS based on the assumption that the system will be shipped to CNS immediately following factory testing.

2.1.4 Evaluate Additional Test Results (Task 4)

This step will be performed after all recommended tests have been addressed by management decision, analysis or by performance. At this point, the V&V Team will examine the original concern and all available data or analysis results. This task may involve the monitoring of testing at CNS by the V&V team.

2.1.5 Report Discrepancies (Task 5)

For those concerns that were not resolved in the above step, discrepancy reports will be issued. if there are any open discrepancies from previous V&V steps, their impact will be evaluated.

2.1.6 Prepare Validation Test Report (Task 6)

This task will pull together all the various records concerning validation testing and organize it into a readable form.

2.2 Testing Requirements

This section presents a general discussion concerning system testing requirements and their relationship to validation. The concepts presented here, should be considered the ideal case. The level of actual testing and validation will be limited by factors such as system size, relative importance of system function, schedule, etc.

2.2.1 Relationship of Validation to Testing

Validation can be defined as, a planned testing and evaluation process that provides assurance that the final system complies with the system requirements and design capabilities.

From this definition it can be seen that validation is more than testing. Testing is a tool used by validation to uncover undiscovered errors. Validation uses testing plus analysis to reach the objectives stated above. The analysis is basically the design of test strategies and procedures, based on knowledge of the system design, that proves system acceptability in an efficient fashion.

2.2.2 Validation Testing

For the ideal case validation testing, (the combination of developer's tests and V&V Team tests), should contain the following elements.

2.2.2.1 Definition of Test Data Set

One job of validation analysis is to identify a test data set that adequately tests the system or function and at the same time is a manageable size. Some criteria for the test data set are:

- The test data set should cover both valid and invalid values and should test special cases like extreme values, points of discontinuity and data dependent on special time sequences.
- The test data set should challenge the function under test for extreme or boundry conditions.
- The test data should "exercise" the program in a specific manner, e.g., causing all branches to be executed or all statements to be executed.

2.2.2.2 Types of Tests

Various types of tests are required for thorough testing. Each test type is designed to test a certain portion or function of the system. It should be noted that there will be considerable overlap between the test types described here. It is anticipated that the actual test procedures will have combinations of test types. However, it is considered beneficial to understand the various test types and their specific test goals.

- Functional Tests

  Functional tests are closely linked to the capabilities matrix and demonstrates that the system meets the system requirements. Some typical function tests are:

  - Data input to alarm/display output
  - Automatic and manual control of displays
  - Data management and control.

- Structural Tests

  Structural tests demonstrate the correct internal workings of the system based on the particular system design. Some typical structural tests are:

  - Data path tests
  - Program paths (branch coverage, etc.) tests
  - System Level Executives and Control.

- Operational Tests

  Operational tests demonstrate that the software and system work correctly in real time and interactively with the user. These tests involve tests covering dynamic response and robustness. Some typical dynamic response operational tests are:

  - Call up time of displays (with system loaded)

- Response time of displays and alarms to dynamic data
- Accuracy and other characteristics of time dependent variables (rates, integrals, etc.)
- Faithfulness of trend or traces
- Data time skew problems with alarms, SPDS displays and quality codes
- Response to noisy inputs (particularly near alarm setpoints).

Some typical robustness tests are:

- Fault messages generated
- Recovery from forced faults (reboot, etc.)
- "Monkey" test (incorrect input sequences, etc.).

2.2.2.3 Test Environment

Validation is a formal testing and evaluation process which imposes certain conditions and constraints on the test environment. These conditions and constraints are not considered part of validation; they are prerequisites to the integrity of the validation process and validity of the results obtained.

Test environment conditions and constraints include:

- Configuration control of the computer software under test.

- Configuration control of any computer software supporting or interfacing with software under test. This includes test database configurations, test drivers, interfacing application programs, utilities, operating system and any other tasks which may interfere with testing and subsequent operation of the computer system.

- Configuration control of the computer hardware and test hardware.

Prior to beginning validation testing, configuration control must be imposed such that the test environment and software under test can be clearly identified by an auditor through the operational life of the software

subject to test. Changes made to the configuration of the software under test and/or software and hardware supporting the test must be traceable throughout the validation process and operational life of the software. Otherwise, the value of validation is questionable due to the potential lack of credibility of the validation results.

Validation does not include specification of configuration management procedures. The procedures can be prepared to best fit the environment of the developer but the following principles must be met as a minimum:

- Software Under Test:
  - Unique identification of each item subject to control including provisions for revision control as changes occur.
  - Means to identify what revision level of each software item is being subjected to test at any given time.
- Support Software:
  - All support software shall be uniquely identified such that the system can be reconfigured as required to support repeatability of tests.
- System Hardware:
  - Hardware configuration for testing must be documented such that any replacements for maintenance or enhancement can be later identified and evaluated with respect to potential impact on validation results.
- Test Hardware:
  - The test hardware (signal generators, etc.) must be documented. The model and serial number of all test equipment should be recorded. Also, all calibration certificates should be current.

2.2.2.4 Test Procedures

Test procedures must be written that will provide the following:

- Reproducible test results
- Recorded results, dated and annotated (the tester should be alert for results other than those specifically requested in the procedures)
- Measurable acceptance criteria where possible (calculation of expected results by hand, etc. often becomes the basis for verification)
- Test environment (both the hardware and software configuration must be controlled)
- Planning for failed tests (i.e., Must rest of test be aborted until problem is fixed? Are results of previously run tests affected?).

In addition to the above elements, test procedures should be scheduled and organized in a logical fashion. Most typically, this involves testing the lower level system building blocks first and building up to more complex function testing. Using this "divide and conquer" approach permits a systematic evaluation and limits the scope of troubleshooting if a test fails.

2.2.2.5 Test Results Evaluation

The evaluation of test results can be broken into three areas:

- Individual Test Procedures

  The test engineer needs to evaluate a system response against the acceptance criteria in the test procedure. However, unless the acceptance criteria is very clear, some interpretation will be necessary. Some decisions that the test engineer must make are:

- •• Is this testing what the writer intended?
- •• Are the results repeatable?
- •• Is there an error in the system or the procedures?
- •• Is some seemingly extraneous system response important?

To help justify these "on the spot" decisions, free annotations in the test record is encouraged. These notes may greatly help testing at later phases.

- Functional Block Test Procedure

At the completion of a group of tests that cover a functional system block (e.g., data acquisition), the set of test data should be evaluated. Any anomalies or unusual occurrences should be investigated to see if there is any significant problem.

- Completion of Entire Test

Following completion of the entire test when all the test data is available, the results should be closely analyzed.

During this analysis any unusually occurrences or problems can be examined in detail.

The results of any of the the three evaluations can range from satisfactory (no problems) to minor concerns (test at earliest convenience) or major concerns (retest before system is turned over).

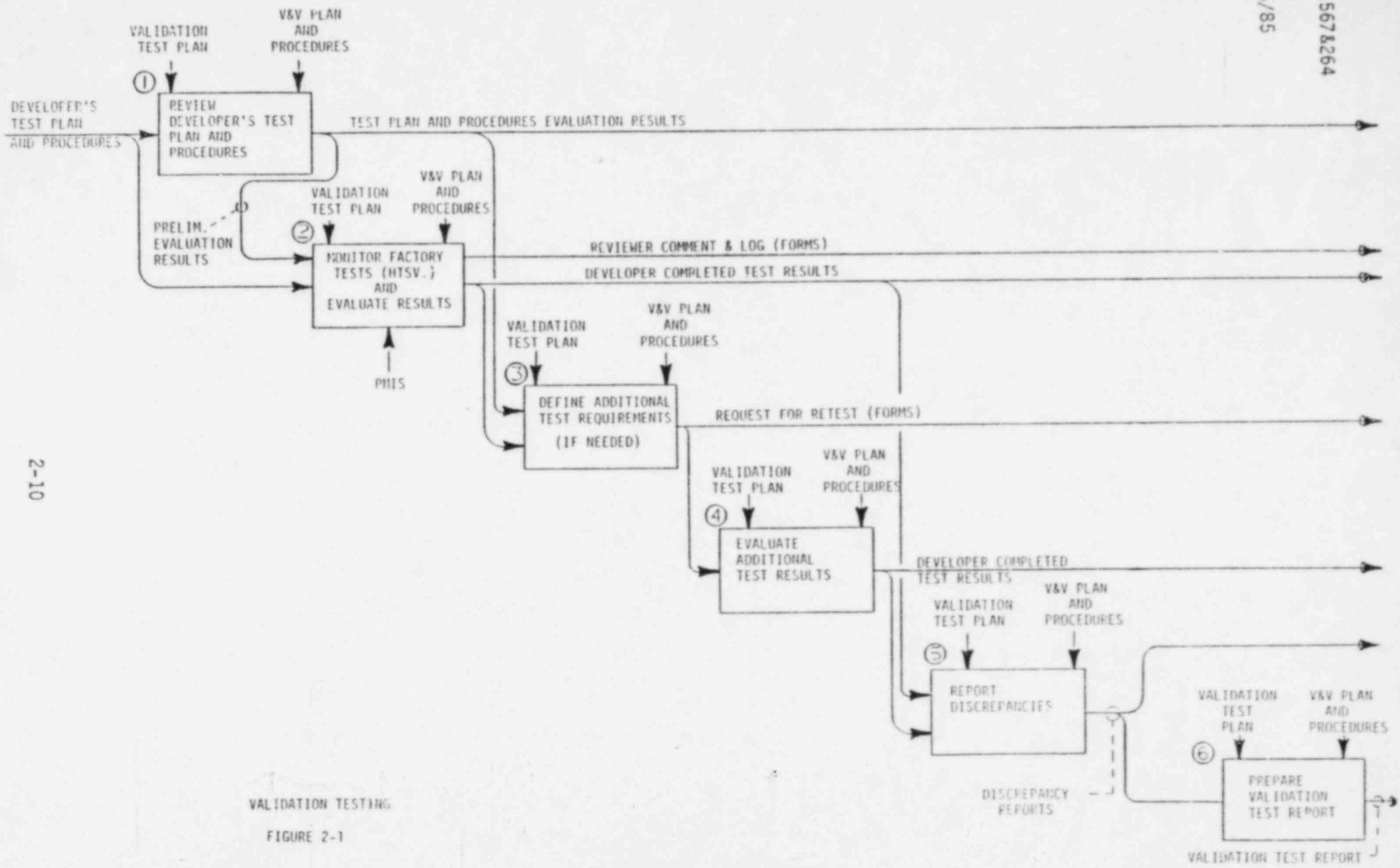
A final question is how do you know when you have tested enough? That is a fundamental question that unfortunately has no precise answer, but requires professional judgment. If errors are still being found every time a program is exercised, testing must continue. In fact, errors tend to cluster so that modules that seem to be particularly error-prone should receive special scrutiny. If after extensive testing of the problem area and no new errors are found, testing may be discontinued.

2.3 System Function Coverage

In the area of functional tests as defined earlier, the V&V Team will use the capabilities matrix (Appendix A) as the means to ensure major system functions are properly tested. The capabilities matrix was originated in the Software Design Verification and is documented in Reference 1.3.8. The capabilities matrix lists major PMIS capabilities and those considered important to the emergency response system as determined from the design documentation. (As NSSS and Special Function design documentation becomes available, capabilities matrices for these systems will be compiled.) Also, the system requirements identified in the System Requirements Verification (Reference 1.3.7) were evaluated against the capabilities matrix to ensure all relevant system requirements were covered by the matrix.

As part of validation testing, the capabilities matrix will be expanded to show which developer test covers a particular function. Any place there is a system capability identified with no corresponding test a discrepancy will be issued.

All hardware capabilities will be tested via operational tests and vendor diagnostic tests. The hardware verification will provide emphasis on documentation considerations.



VALIDATION TESTING

FIGURE 2-1

3. VALIDATION TEST PROCEDURES

This section provides V&V Team procedures for the first four tasks identified in Figure 2.1 and in Section 2. Tasks 5 and 6 are self-explanatory and therefore require no additional procedures. These procedures are generic in that they can be applied to either the PMIS, NSSS or Special Functional validation testing. Whether the testing is performed at the factory or at CNS, the same basic procedures apply.

3.1 Evaluation of Developer's Test Plan and Test Procedures

The developer's test plan should be evaluated using the following guidelines:

1. The criteria for the evaluation should be defined. Criteria items could include items such as:
   - clarity of test philosophy and approach
   - conformance with contract requirements
   - definition of testing scope and placement of emphasis
   - definition of documentation, configuration management and QA
   - definition of test team organization.
2. The evaluation should be in the form of a formal response.
3. The evaluation should be issued in two phases:
   - Preliminary - Provide developers some input as soon as possible to allow developers time for revisions
   - Final - Formal response submitted as part of the final validation report which will evaluate how well the actual testing conformed to the plan.

The developers test procedures should be evaluated using the following guidelines:

1. The test procedures should be evaluated against the developers test plan. Deviations between the plan and procedures should be reconciled, if possible.

2. The test procedures should be correlated against the system functional capabilities matrix. Any cases where major system functions are not being tested, should be flagged.

3. The procedures themselves should be checked for:

   - Understandability - Can the test engineer be expected to understand the goal of the test?

   - Correct format

   - Completeness - Are all necessary parts of the procedure specified

   - Consistency with design documentation.

4. Based on the above evaluation, any additional tests felt necessary by the V&V Team should be specified.

5. The evaluation should be issued in two phases:

   - Preliminary - Provide developers some input as soon as possible to allow developers time for revisions.

   - Final - Formal response submitted as part of the final validation report.

3.2 Test Monitoring

This section describes the role of the V&V Team during testing. Note that for the NPPD system testing will be performed at both the factory and at the CNS site. The following guidelines should be used by the V&V Team during testing:

1. The V&V Team should review the test procedures and test schedule and notify the developers concerning the tests the V&V Team will witness. The V&V Team level of participation in testing may vary depending upon level of system and subsystem importance.

2. The V&V Team should be allowed to witness any portion of the testing, however, V&V Team presence is not required to conduct a test.

3. The V&V Team should have access to a copy of all test results and revisions to the controlled test procedure document.

4. The V&V Team should maintain a Validation Test Log. The format of the log to be maintained is described in Appendix B. The log should contain all sequential sheets and any reviewer comment or discrepancy forms issued during testing. If desired, the developers and QA obtain a copy of the Validation Test Log. The log should describe the testing and any supporting information or observations of the V&V Team. This log will become part of the final V&V documentation.

5. The testing should be monitored to ensure that the procedures are followed and that system performance is acceptable. If possible, before or during system testing the capability matrix should be checked off and filled in to indicate a system function has been tested. Beyond this, the V&V Team should monitor for the good test practices. The following list is a checklist of items to be considered. A "no" to any of these questions should be recorded in the Validation Test Log. If a serious problem is uncovered, a discrepancy report form (PART 1) should be issued. Other, less serious problems or questionable areas should be reported via the reviewer comment form. (Refer to Appendix B for Reviewer Comment form and Discrepancy Report form.):

   - Is the test objective and scope of the test clear to test engineer and those involved in judging system acceptability?

   - Can tests be run according to the procedure?

- Does the system response meet or exceed the acceptance criteria?

- Is the test result being properly documented?

- Is there subjective judgement involved in deciding whether the acceptance criteria is met?

- Are the test personnel following their own QA and configuration management procedures?

- Is the system (hardware/software) and test system (hardware/software) under administrative and document control to ensure procedures are being followed?

- Is the system response repeatable?

- Are there any spurious, unexplained responses?

- Are there any system responses that are obvious prob-lems, for cases not strictly covered by procedure?

- Is the test equipment properly calibrated?

- Are test procedure changes handled in an acceptable, controlled fashion?

  When tests fail, is proper consideration given to retest?

3.3 Defining Additional Tests

If, as a result of the V&V Team evaluation of the test procedures or from test monitoring, the V&V Team considers that added tests are necessary, a reviewer comment form should be used to define the recommended tests. Note that the recommendation for additional tests may be issued during testing or following evaluation of results after testing has ended.

The V&V Team should be very specific in the definition of the testing problem - e.g., refer to test procedure, documented results, function under test, test engineer and time and date. When possible, the V&V Team should recommend a modification (or mark-up) an existing test procedure to minimize test procedure writing. However, the actual testing and procedure writing, if required, should be done by the developers.

3.4 Evaluation of Test Results

When the test data is available for close scrutiny, the V&V Team will evaluate the results against the following general criteria:

- How well are the system requirements and capabilities tested? (Capabilities Matrix)
- Has any software under test not been tested?
- Is there any relationship between groups of errors found?
- Was retesting sufficient to test not only the changes or corrections, but for other possible impact?
- Are new tests or types of tests required to find new errors related to errors found?
- Was data structure tested?
- Was control structure tested?
- Are test results adequately recorded and annotated?

Following this effort, additional tests may be recommended, as described above.

3.5 Retesting - If Test Fails

This section addresses the procedure to be followed if a test fails to meet the acceptance criteria in test procedure or if the V&V Team considers that retesting is necessary, independent of the test procedures. The following guidelines should be followed:

- The existing procedures should be followed if acceptance criteria in the test procedure is not met. The procedures defined in Section 2.5.6 of the developer test procedures, Reference 1.3.17.

- If only the V&V Team has a concern over a test procedure or results, a reviewer comment form should be issued describing the concern and, if appropriate, recommend added tests. If the V&V Team considers the problem serious, a discrepancy report should be issued. Copy of the reviewer comment or discrepancy report form should be provided to QA, the Development Team supervisor in charge of conducting the tests, and the NPPD representative.

- The responsibility to address the reviewer comment or discrepancy ultimately lies with the NPPD representative who should make the final decision of what action, if any is to be taken. In most cases, it is anticipated that a joint agreement be reached between the NPPD representative, the Development Team and the V&V Team. Some of the means to address the V&V Team concerns/discrepancies are:

  - Perform retest
  - Perform new test
  - Defer additional testing until a later time
  - Perform analysis to show acceptability
  - Make decision to do none of the above.

APPENDIX A

Capabilities Matrix

CAPABILITIES MATRIX 01/29/85

PROJECT: NPPD - PMIS

V&V TEAM LEADER: A.F.LEXA

V&V TEAM MEMBERS: B.D.PAUL
B.S.PAUL
J.A. McCLESKEY

ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
1.00	VAX VMS OPERATING SYSTEM WITH NO MODIFICATIONS	22.00	2.6 FSPEC-RA VMS			
2.00	OPERATING SYSTEM WILL KEEP ERROR LOG AND BE CAPABLE OF REPORTING SYSTEM ERRORS, CONFIGURATION CHANGES, AND SYSTEM EVENTS	25.00 PARTIAL	2.6.2.2 FSPEC-RA VMS			
3.00	SYSTEM POINT ALARMED BY HEALTH MONITOR AND UPDATED PMIS - # OF ANALOG POINTS PROCESSED LAST SECOND	NONE	2.6.2.2 FSPEC-RA DD-NONE			RC 1 & 7
4.00	SYSTEM POINT ALARMED BY HEALTH MONITOR AND UPDATED PMIS - # OF DIGITAL POINTS PROCESSED LAST SECOND	NONE	2.6.2.2 FSPEC-RA DD-NONE			RC 1 & 7
5.00	SYSTEM POINT ALARMED BY HEALTH MONITOR AND UPDATED PMIS - # OF SOE POINTS PROCESSED LAST RECORD	NONE	2.6.2.2 FSPEC-RA DD-NONE			RC 1 & 7
6.00	SYSTEM POINT ALARMED BY HEALTH MONITOR AND UPDATED PMIS - # OF ARCHIVE TRANSACTIONS GENERATED LAST SECOND	NONE	2.6.2.2 FSPEC-RA DD-NONE			RC 1 & 7
7.00	SYSTEM POINT ALARMED BY HEALTH MONITOR AND UPDATED PMIS - # OF ALARM TRANSACTIONS GENERATED LAST SECOND	NONE	2.6.2.2 FSPEC-RA DD-NONE			RC 1 & 7

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PROJECT: NAPD - PMIS

V&V TEAM LEADER: A.F.LEXA

V&V TEAM MEMBERS: B.D.PAUL
B.S.PAUL
J.H. McCLESKEY

ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
8.00	SYSTEM POINT ALARMED BY HEALTH MONITOR AND UPDATED BY PMIS - AMOUNT OF CPU AVAILABLE OVER LAST 10 MINUTES	NONE	2.6.2.2 FSPEC-RA DD-NONE			RC 7
9.00	ONLINE ISOLATION OF FAULTS IN DATA ACQUISITION EQUIPMENT UNDER CONTROL OF PMIS	28.00	2.6.3.1 FSPEC-RA DD-NONE			RC 7
10.00	IDT SECURITY - ATTRIBUTES OF IDT ASSIGNED THRU MM CONSOLE DATA ASSIGNMENT DISPLAY - SW FUNCTION AVAILABLE THRU TERMINAL	32.00	2.6.5.1 FSPEC-RA DD-NONE			RC 7 & 9
11.00	IDT SECURITY - POINT I/O SUMMARY LIST UPDATE CAPABILITY FOR EACH DATA FIELD ASSIGNED THRU MM CONSOLE DATA ASSIGNMENT DISPLAY	32.00	2.6.5.1 FSPEC-RA DD-NONE			RC 7 & 9
12.00	THRU MM TURN-ON CODE ASSIGNMENT TEMPLATE CAN ASSIGN SECURITY LEVEL TO SW FUNCTION. SPECIFIES WHICH SW FUNCTION CAN BE RUN FROM WHICH IDT.	32.00	2.6.5.1 FSPEC-RA MEDSPH DD1-8/8/84 DD-PARTIAL SET LEVEL			RC 7 & 9
13.00	SECURITY PASSWORD MODIFICATION SW FUNCTION - SYSTEM MANAGER CAN ALTER PMIS USER PASSWORDS	32.00	2.6.5.1 FSPEC-RA MSSECURZ DD1-8/8/84	9		RC 9

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PROJECT: NAPD - PMIS

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
14.00	SECURITY LEVEL PASSWORD SW FUNCTION - USER MUST KN OW THEIR PASSWORD TO LOGON TO PMIS UNDER PROPER SE CURITY LEVEL	32.00	2.6.5.1 FSPEC-RA MSPASSWI DD1-8/8/84 MSLOGONI DD1-8/8/84	9		RC 9
15.00	POINT I/O LIST FILE SECURITY - IDT REQUESTING MODI FICATION TO DATA FIELD MUST HAVE GREATER OR EQUAL SECURITY LEVEL THAN THAT OF DATA FIELD	32.00	2.6.5.1 FSPEC-RA DBVERPID DD1-8/8/84			RC 9
16.00	DEFAULT CONTROL TO MM EXEC. 5 MINS. AFTER ACTIVITY CEASES AND SECURITY LEVEL PASSWORD DISPLAY APPEAR S	32.00	2.6.5.1 FSPEC-RA DD-NONE	9		RC 7 & 9
17.00	AUTOMATIC LOGOUT AFTER 5 MINUTES OF NO ACTIVITY WI LL BE RECORDED INTO SYSTEM - OPERATOR LOG	32.00	2.6.5.1 FSPEC-RA DD-NONE			RC 7 & 9
18.00	MM EXECUTIVE CAN ENABLE SYSTEM MANAGER ACCESS TO A LL SYSTEM FUNCTIONS AND ALL DATA REGARDLESS OF "OW NER"	33.00	2.6.5.2 FSPEC-RA DD-NONE			RC 7
19.00	ERROR LOG - ATTEMPTS TO GAIN ACCESS TO UNAUTHORIZE D PRIORITY LEVELS AND FUNCTIONS WILL BE RECORDED I N SYSTEM OPERATOR LOG WITH USER ID INFO	34.00	2.6.5.3 FSPEC-RA DD-NONE			RC 7 & 9

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PROJECT: NPPD - PMIS

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
20.00	DISTRIBUTED SW SECURITY - GRAPHICS DISPLAY LOCAL M EMORY WILL BE PROTECTED AGAINST MODIFICATION OR AD DITIONS BY UNAUTHORIZED PERSONNEL	35.00	2.6.5.4 FSPEC-RA DD-NONE			RC 7 & 9
21.00	DAS SCAN PLAN DOWNLOADED FROM PMIS TO CPI DATA CON CENTRATORS ON DEMAND	36.00 PARTIAL	2.7 FSPEC-RA DALDPLANZ DD1-8/8/84 DD-PARTIAL ON DEMAND			RC 7
22.00	DAS SCAN PLAN GENERATED FROM SYSTEM'S DATA BASE	36.00 PARTIAL	2.7 FSPEC-RA DD-NONE			RC 7
23.00	DAS SCAN PLAN LIST 1 CONTAINS POINTS WITH SCAN FRE QUENCY OF GREATER THAN OR EQUAL TO 1 SECOND AND AR E REQUESTED BY HOST ONCE PER SECOND	36.00 PARTIAL	2.7 FSPEC-RA DD-NONE			RC 2 & 7
24.00	DAS SCAN PLAN LIST 2 CONTAIN UP TO 50 POINTS WITH SCAN RATE OF 1/10 SECOND AND ARE REQUESTED BY HOST 10 TIMES PER SECOND	36.00 PARTIAL	2.7 FSPEC-RA DD-NONE			RC 2 & 7
25.00	DAS HAS STATISTCIAL LOAD - LEVELING ALGORITHM	36.00 PARTIAL	2.7 FSPEC-RA DAPPARCZ DD1-8/8/84 DD-PARTIAL ALGORITHM			RC 7

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PROJECT: NPPD - PMIS

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
26.00	DAS ANALOG POINT PROCESSING - A/D CONVERTER OFFSET CORRECTION	36.00 PARTIAL	2.7 FSPEC-RA DD-NONE			RC 7
27.00	DAS ANALOG POINT PROCESSING - SENSOR REASONABLE HI GH/LOW LIMIT CHECKING OF CORRECTED COUNTS	36.00 PARTIAL	2.7 FSPEC-RA DALIMIT DD1-8/8/84			
28.00	DAS ANALOG POINT PROCESSING - SENSOR RANGE HIGH/LO W LIMIT CHECKING OF CORRECTED COUNTS	36.00 PARTIAL	2.7 FSPEC-RA DAPPARCZ DD1-8/8/84			
29.00	DAS ANALOG POINT PROCESSING - OPEN THERMOCOUPLE DE TECTION	36.00 PARTIAL	2.7 FSPEC-RA DAFRENDZ DD1-8/8/84			
30.00	DAS ANALOG PT. PROCESSING - ENGINEERING UNITS CONV ERSION	36.00 PARTIAL	2.7 FSPEC-RA DAPPARCZ DD1-8/8/84 DATC DARTD DD1-8/8/84 DAEUCONV DD1-8/8/84			

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PROJECT: NPPD - PMIS

V&V TEAM LEADER: A.F.LEXA

V&V TEAM MEMBERS: B.D.PAUL
B.S.PAUL
J.H. McCLESKEY

ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
31.00	DAS ANALOG PT. PROCESSING - ALARM MONITORING AND A LARMING	36.00 PARTIAL	2.7 FSPEC-RA DALIMIT DD1-8/8/84 DAPPARI DD1-8/8/84			
32.00	DAS ANALOG PT. PROCESSING - UPDATE CVT WITH ENGINE ERING VALUE & QUALITY CODE	36.00 PARTIAL	2.7 FSPEC-RA DALIMIT DD1-8/8/84			
33.00	DAS ANALOG PT. PROCESSING - ARCHIVE ANALOG POINT	36.00 PARTIAL	2.7 FSPEC-RA DALIMIT DD1-8/8/84 DAPPARCI DD1-8/8/84			
34.00	DAS DIGITAL PT. PROCESSING - ALARM MONITOR BASED O N SPECIFIED STATE OR CHANGE-OF-STATE	36.00 PARTIAL	2.7 FSPEC-RA DADIGP DD1-8/8/84			
35.00	DAS DIGITAL PT. PROCESSING - ARCHIVED BY CHANGE-OF -STATE CONDITION	36.00 PARTIAL	2.7 FSPEC-RA DADIGP DD1-8/8/84			

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PROJECT: NPPD - PMIS

V&V TEAM LEADER: A.F.LEXA

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
36.00	DAS SOE PT PROCESSING - REQUEST ALL SOE INPUTS REC EIVED BY DATA CONCENTRATOR DURING PREVIOUS FAST-SC AN INTERVAL	36.00 PARTIAL	2.7 FSPEC-RA DD-NONE			RC 7
37.00	DAS SOE PT. PROCESSING - ALARM MONITOR BASED ON SP ECIFIED STATE OR CHANGE-OF-STATE	36.00 PARTIAL	2.7 FSPEC-RA DD-NONE			RC 7
38.00	DAS SOE POINT PROCESSING - SOE POINTS MAY BE DEFIN ED AS "TRIGGER" POINTS	36.00 PARTIAL	2.7 FSPEC-RA DD-NONE			RC 7
39.00	DAS PULSE INPUTS PROCESSING - CHANGES OF STATES AC CUMULATED BY PULSE ACCUMULATOR REGISTER IN FRONT-E ND DAS HW	36.00 PARTIAL	2.7 FSPEC-RA DD-NONE			RC 7
40.00	DAS DIGITAL OUTPUTS PROCESSING - ALL DIGITALS PROC ESSED ONCE PER SECOND	36.00 PARTIAL	2.7 FSPEC-RA DAFRENDZ DD1-8/8/84			
41.00	DAS ANALOG OUTPUTS PROCESSING - ALL ANALOGS PROCES SED ONCE PER SECOND	36.00 PARTIAL	2.7 FSPEC-RA DAFRENDZ DD1-8/8/84			

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J.H. McCLESKEY

ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
42.00	POINT ID FORMAT - DISTRICT'S ENGINEERS WILL BE ABLE TO EASILY DESIGN OR REASSIGN POINT ID'S & DESCRIPTIONS	37.00	2.7.1 FSPEC-RA MSPIOZ DD1-8/8/84			
43.00	DERIVE VARIABLES - DYNAMIC CREATION AS A FUNCTION OF REAL AND OTHER DERIVED VARIABLES WITH MAX. OF 8 INPUTS	38.00	2.7.2 FSPEC-RA DD-NONE			RC 7
44.00	GENERAL CALCULATIONS - EXTERNAL REAL POINT DEFINITIONS MAY BE ADDED, DELETED OR MODIFIED BY OPERATOR VIA NMIS	39.00	2.7.2 FSPEC-RA MSPIOZ DD1-8/8/84			
45.00	POINT CALIBRATION - INTERACTIVE POINT CALIBRATION TASK ALLOWS SENSOR CALIBRATION CONSTANTS TO BE DERIVED	40.00	2.7.3 RSPEC-RA DD-NONE	25		RC 7
46.00	A TO D CONVERSION CALIBRATION - DATA CONCENTRATOR SOFTWARE WILL AUTOMATICALLY AND PERIODICALLY PERFORM A TWO-POINT CALIBRATION FOR EACH A TO D CONVERTER AT EACH ADC GAIN SETTING WITHIN THE SYSTEM.	41.00	2.7 FSPEC-RA DD-NONE			RC 7
47.00	POINT SCAN RATE - SCAN CLASSES CURRENTLY SUPPORTED ARE: CLASS A -.1 SEC. CLASS B - 1 SEC. CLASS C - 5 SEC. CLASS D - 15 SEC. CLASS E - 30 SEC. CLASS F - 60 SEC. CLASS G - 120 SEC. CLASS H - 15 MIN.	42.00	2.7.5 FSPEC-RA DD-NONE	27 PARTIAL		RC 7

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B.S.PAUL
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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
48.00	DATA VALIDATION & INPUT ERROR CHECKING - SAIPMS DA S ASSIGNS DATA QUALITY CODE TO EACH FIELD INPUT & CALCULATED POINT AT TIME POINT IS PROCESSED	43.00	2.7.6 FSPEC-RA DALIMIT DD1-8/8/84 DAPPARCI DD1-8/8/84			
49.00	DATA VALIDATION & INPUT ERROR CHECKING - SAIPMS PR OVIDES FOR ALARM MONITORING OF ALL REAL VALUE & LO GICAL VALUE POINTS DEFINED IN SYSTEM DATA BASE - ALARMING CRITERIA FOR EACH POINT DEFINED IN DATABA SE	43.00	2.7.6 FSPEC-RA DALIMIT DD1-8/8/84 DAPPARCI DD1-8/8/84			
50.00	ANALOG INPUT - VALIDATION CHECKS - INVALID - DATA CONDITIONS DETECTED BY DATA CONCENTRATOR PRIOR TO A/D GAIN/OFFSET CORRECTION OF RAW DATA COUNTS - DAS HW ERROR & OPEN THERMOCOUPLE. IF NOT DISABLED FROM PROCESSING OR ALARMING POINT IS ASSIGNED DATA QUALITY CODE BAD OR OTC	43.00	2.7.6.1 FSPEC-RA DAFRENDI DD1-8/8/84			RC 3
51.00	ALARM MONITORING-IF POINT CURRENTLY DELETED FROM S CAN/PROCESSING, DATA QUALITY CODE OF DEL IS ASSIGN ED & NO FURTHER PROCESSING OF POINT IS PERFORMED	43.00	2.7.6.2 FSPEC-RA DD-NONE	22		RC 7
52.00	ALARM MONITORING - SENSOR LIMIT CHECK. PRIOR TO EU CONVERSION CORRECTED COUNTS VALUE OF EACH ANALOG INPUT CHECKED AGAINST DEFINED ADC/TRANSDUCER RANGE IF VALUE EXCEEDS HIGH/LOW LIMITS, POINT ASSIGNED D ATA QUALITY CODE BAD & NO EU CONVERSION ATTEMPTED	43.00	2.7.6.2 FSPEC-RA DAPPARCI DD1-8/8/84 DD-PARTIAL			RC 7

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53.00	ALARM MONITORING CHECKS - IF POINT CURRENTLY DISAB LED FROM ALARM PROCESSING, ASSIGNED DATA QUALITY C ODE DALM & NO FURTHER ALARM CHECKS MADE	43.00	2.7.6.2 FSPEC-RA DD-NONE	23 PARTIAL		RC 7
54.00	ALARM MONITORING CHECKS - IF SUBSTITUTE VALUE ENTE RED FOR POINT, POINT ASSIGNED DATA QUALITY CODE OF SUB & NO FURTHER ALARM CHECKS MADE	43.00	2.7.6.2 FSPEC-RA DD-NONE	18 PARTIAL		RC 7
55.00	ALARM MONITORING CHECKS - IF POINT EXCEEDS DESIGNE D ENGINEERING RANGE ASSIGNED QUALITY CODE OF HRL O R LRL	43.00	2.7.6.2 FSPEC-RA DALIMIT DD1-8/8/84			
56.00	ALARM MONITORING CHECKS - IF POINT HAS DEFINED RED UNDANT POINT & NOT MATCH DEFINED POINT WITHIN SPEC IFIED TOLERANCE, ASSIGN QUALITY CODE OF REDU & RES CAN CHECK PERFORMED	43.00	2.7.6.2 FSPEC-RA DD-NONE			RC 5 & 7
57.00	ALARM MONITORING CHECKS - IF POINT EXCEEDS DEFINED HIGH/LOW ALARM LIMITS ASSIGN DATA QUALITY CODE OF HALM OR LALM	43.00	2.7.6.2 FSPEC-RA DALIMIT DD1-8/8/84			
58.00	ALARM MONITORING CHECKS-IF POINT EXCEEDS ITS DEFIN ED HIGH/LOW WARNING LIMITS ASSIGNED QUALITY CODE O F HWRN OR LWRN	43.00	2.7.6.2 FSPEC-RA DALIMIT DD1-8/8/84			

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
59.00	ALARMING OF CONTACT/BOOLEAN INPUTS - EACH POINT MA Y BE ALARM MONITORED AGAINST DEFINED LOGICAL STATE OR DEFINED CHANGE-OF-STATE CONDITIONS DATA QUALIT Y CODE OF ALARM ASSIGNED IF MEETS DEFINED STATE	43.00	2.7.6.3 FSPEC-RA DADIGP DD1-8/8/84 DD-PARTIAL			RC 7
60.00	ALARMING OF CONTACT/BOOLEAN INPUTS - SET/RESET MES SAGE IS DEFINED FOR EACH LOGICAL POINT IN SYSTEM D ATA BASE. MESSAGE OPERATOR WISHES DISPLAYED WHEN POINTS STATUS IS TRUE & WHEN FALSE	43.00	2.7.6.3 FSPEC-RA DD-NONE			RC 7
61.00	ALARM INHIBIT CHECK - IF CUT-OUT POINTS' STATE MAT CHES SPECIFIED ALARM INHIBIT STATE POINT ASSIGNED QUALITY CODE INHB & NO ALARM TRANSACTION GENERATED	43.00	2.7.6.3.1 FSPEC-RA DD-NONE			RC 7
62.00	RETURN TO NORMAL - R TO N ALARM TRANSACTIONS OCCUR S WHEN ALARMED POINT RETURNS TO NORMAL CONDITION	43.00	2.7.6.3.2 FSPEC-RA DD-NONE			RC 7
63.00	DATA BASE EDITING - DATABASE IS MODIFIED VIA DATAB ASE IDT DISPLAYS REQUESTED & RUN ONLINE UNDER CONT ROL OF SAIPMS MAN-MACHINE EXECUTIVE	44.00	2.8.1.2 FSPEC-RA MSPIOI DD1-8/8/84	24		
64.00	DATA BASE EDITING - ALL MODIFICATIONS TO POINT I/O SUMMARY LIST FILE GENERATE COMPLETE AUDIT TRAIL	44.00	2.8.1.2 FSPEC-RA DBCHANGE DD1-8/8/84	25		

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65.00	DATA BASE SAVE/RESTORE/COMPARE - DATABASE COMPARES DICTATE WHICH RECORDS ON FILE NOT MATCH BY REVISION NUMBER & PRINT INFO FOR EACH DIFFERENCE FOUND BETWEEN TWO FILES	47.00	2.8.1.3 FSPEC-RA DD-NONE			RC 7
66.00	ALARM PROCESSING - SOFTWARE PROVIDE CAPABILITY TO INITIATE PROGRAM(S) IF POINT EXTERNAL OR DERIVED EXCEEDS ANY LIMITS	49.00	2.9.1 FSPEC-RA EXTRIGGER DD1-8/8/84			
67.00	ALARM PROCESSING - LIMIT CHECKING - INVALID FLAG (BAD QUALITY) PROPAGATES THROUGH ALL DERIVED POINTS FORMULATED FROM ONE OR MORE INVALID POINTS	50.00	2.9.1 FSPEC-RA DD-NONE			RC 7
68.00	ALARM DEADBAND-SAIPMS PROVIDES ALARM DEADBAND VALUE DEFINED IN SYSTEM DATABASE FOR EACH ANALOG/PSEUDO-ANALOG POINT	54.00	2.9.2 FSPEC-RA DD-NONE			RC 7
69.00	DYNAMIC TRACKING LIMITS - PROVISION MADE FOR DYNAMIC TRACKING LIMITS PERIODICALLY CALCULATED BASED ON PLANT STATUS TO ALLOW PROCESS LIMIT SETPOINTS TO TRACK CHANGES IN PLANT CONDITIONS & APPLIES TO ANALOG & DIGITAL POINTS BASED ON PLANT MODE	55.00	2.9.3 FSPEC-RA DD-NONE	28		RC 7
70.00	ARCHIVAL STORAGE-ARCHIVE PROCESSOR PROVIDES 2 HRS. PRE- & 12 HRS. POST-EVENT DATA & 2 WEEKS POST-EVENT DATA RETENSION ON MAGNETIC TAPE	56.00	2.10.1 FSPEC-RA DAARCHIVE DD1-8/8/84 DD-PARTIAL			RC 7

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71.00	ARCHIVAL STORAGE - EVENT MAY BE DECLARED BY MANUAL OPERATOR ENTRY SUPPORTED BY SAIPMS	56.00	2.10.1 FSPEC-RA DD-NONE	35		RC 7
72.00	ARCHIVAL STORAGE - DATA TIME-TAGGED WHEN SCANNED & NOT PROCESSED	56.00	2.10.1 FSPEC-RA DD-NONE			RC 7
73.00	ARCHIVAL STORAGE-ALARM TRANSACTIONS ENTERED INTO A RCHIVES REGARDLESS COMPRESSION LIMITS	56.00	2.10.1 FSPEC-RA DALIMIT DD1-8/8/84 DD-PARTIAL			RC 7
74.00	ARCHIVAL STORAGE - ANY CHANGE IN POINT QUALITY RES ULTS IN POINT BEING ARCHIVED TO ARCHIVE FILE	56.00	2.10.1 FSPEC-RA DD-NONE			RC 7
75.00	QUICK-LOOK STORAGE FUNCTION MAINTAINS CIRCULAR FIL E CONTAINING DATA FOR MAX OF 150 POINTS RECORDED O NCE-PER-SECOND FOR MAXIMUM OF 30 MINUTES	56.00	2.10.1.1 FSPEC-RA DAQLOK DD1-8/8/84			
76.00	HISTORICAL DATA RETRIEVAL-INFORMATION RETRIEVAL FU NCTION ALLOWS OPERATOR TO DEFINE PARAMETERS REQUIR ED TO RETRIEVE DATA FROM ARCHIVES & PRODUCE PLOTS AND REPORTS	57.00	2.10.2 FSPEC-RA DD-NONE			RC 7

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
77.00	ARCHIVAL REPLAY (PLAYBACK)-PROVIDE CAPABILITY TO R EPLAY DISPLAYS OF HISTORICAL DATA CLOSE AS POSSIBL E TO REAL-TIME & PROVIDE FAST FORWARED & RESTART A T SPECIFIED TIME	58.00	2.10.3 FSPEC-RA MSPLAYBZ DD1-8/8/84			
78.00	ARCHIVAL REPLAY (PLAYBACK) - CAPABILITY EXIST TO R EPLAY SPDS DISPLAYS USING HISTORICAL DATA FOR TRAI NING & EVENT ANALYSIS TO BE AVAILABLE ONLY ON BAUX UP PROCESSOR	58.00	2.10.3 FSPEC-RA MSPLAYBZ DD1-8/8/84 DD-PARTIAL			RC 7
79.00	GRAPHICS DISPLAY SOFTWARE - PMIS PROVIDE APABILIT Y TO CREATE, MODIFY, STORE, DISPLAY, & DE ETE COLO R-GRAPHIC DISPLAY FROM ANY DISPLAY CONSO : BASED O N USER ACCESS LEVEL	59.00	2.11 FSPEC-RA GPDRVZ GPJDRZ GPQDRZ DD1-8/8/84 DD-PARTIAL	7, 8 PARTIAL		RC 7
80.00	DISPLAY BUILD - SW ALLOW ENGINEER PROGRAMMER EASIL Y BUILD STATIC DISPLAY FOR SUBSEQUENT RETRIEVAL & UPDATE FROM ANY CONSOLE & ASSIGN DYNAMIC DATA POIN TS FROM ANY PMIS DATABASE TO DISPLAYS & ASSIGN CHA RACTERISTICS TO DYNAMIC PORTIONS.	60.00	2.11.1 FSPEC-RA DD-PARTIAL SEE #79	5, 7, 8		RC 7
81.00	CURRENT TIME - WILL BE DISPLAYED ON ALL DISPLAYS I N HRS., MINS., & SECS., & UPDATED ONCE-PER-SEC. IN 24 HR. FORMAT.	67.00	2.11.2.1 FSPEC-RA MEUPDT DD1-8/8/84 MEUPTM DD1-8/8/84 DD-PARTIAL	9		RC 7

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
82.00	CURRENT DATE - CURRENT MO., DAY, & YR UPDATED EACH MIDNIGHT & DISPLAYED BY SAIPMS ON ALL DISPLAYS	68.00	2.11.2.2 FSPEC-RA MEUPTM DD1-6/8/84 DD-PARTIAL			RC 7
83.00	FAILOVER SOFTWARE HEALTH MONITOR RUNS AT LOWEST PRIORITY IN SYSTEM TO USE CPU IDLE TIME TO RUN DIAGNOSTICS. IF DIAGNOSTIC FAILS OR PMIS SW STALL BECAUSE HW OR SW FAULTS WATCHDOG TIMER TIMEOUT & FAILOVER OCCUR	76.00	2.13 FSPEC-RA EXHEALTHZ DD1-8/8/84 DD-PARTIAL			RC 7
84.00	FAILOVER SOFTWARE-BACKUP CPU EXECUTES SAME ROUTINES TO VERIFY STATUS	76.00	2.13 FSPEC-RA DD-NONE			RC 7
85.00	FAILOVER SOFTWARE - IF BACKUP FAILS OPERATOR NOTIFIED	76.00	2.13 FSPEC-RA DD-NONE			RC 7
86.00	FAILOVER SOFTWARE - EXECUTIVE SW USES PROCESS INFO FILE TO DETERMINE PROCESSES TO START AND WHEN BASED ON MODE OF OPERATION - PRIMARY WITH/WITHOUT BACKUP, BACKUP WITH INITIALIZATION, BACKUP WITH PRIMARY	76.00	2.13 FSPEC-RA DD-NONE			RC 7
87.00	FAILOVER INITIATED IN CASE OF FAILURE OF CRITICAL PROCESS	76.00	2.13 FSPEC-RA EXTRMBX DD1-8/8/84 EXECZ DD1-8/8/84			

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88.00	FAILOVER INITIATED IN CASE OF FATAL ERROR DETECTED BY HEALTH MONITOR.	76.00	2.13 FSPEC-RA EXHEALTHZ DD1-8/8/84 EXWATCH DD1-8/8/84 DD-PARTIAL			RC 7
89.00	FAILOVER INITIATED IN CASE OF OPERATOR-REQUESTED F AILOVER	76.00	2.13 FSPEC-RA EXECZ DD1-8/8/84 MSFAILZ DD-8/8/84			
90.00	FAILOVER - SINCE 2 DUAL-PORTED REDUNDANT CPI PREPR OCESSORS, IF ONE FAILS BOTH ONLINE & BACKUP CPU'S OBTAIN DATA FROM OTHER.	76.00	2.13 FSPEC-RA DAFRENDZ DD1-8/8/84 DD-PARTIAL			RC 7
91.00	LIMIT CHECKING ANALOGS - POINTS CHECKED FOR UP TO 4 LIMITS - RATE-OF-CHANGE PERFORMED AS POINT TRANS FORM. POINT FAILING CHECK WILL TRIGGER ALARM & LOG & CAN INITIATE PROGRAM	51.00	2.9.1 FSPEC-RA			
92.00	LIMIT CHECKING DIGITALS - CHECK FOR SPECIFIED STAT E, CHANGE-OF-STATE. MAY TRIGGER ALARM WHICH IS LOG GED & CAN INITIATE PROGRAM	52.00	2.9.1 FSPEC-RA			

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93.00	LIMIT CHECKING ALL POINTS - WHEN EXCEED ANY LIMIT, PLACE ON MASTER ALARM LIST	53.00	2.3.1 FSPEC-RA			
94.00	THROUGH 199.00 * INTENTIONALLY LEFT BLANK * **********	NONE				
200.00	DATA QUALITY & VALIDATION - GENERAL - SPDS FIELD INPUT POINTS SAMPLED BY THE PMIS ARE APPENDED BY A DATA QUALITY CODE	0.10	2.1 DDSPDS			RC 22
201.00	THE SPDS QUALITY CODE OF A CALCULATED DATA POINT USUALLY IS DEFINED AS THE WORST QUALITY CODE OF ANY OF THE INPUTS TO THE CALCULATION. EXCEPTIONS TO THIS GENERAL RULE ARE: (A) THE "HEALTHY AVERAGE" AND "HEALTHY MAXIMUM" (B) SPECIAL CALCULATIONS	NONE	2.1 DDSPDS			RC 22
202.00	ALL DATA IS QUALITY CHECKED BY PMIS. THE DATA QUALITY CODE IS USED TO ASSIGN COLOR FILL FOR SPDS DISPLAYS. TABLE 2-1 DEFINES THE QUALITY CHECKS PERFORMED AND ASSIGNED COLOR	NONE	2.1 & 2.21 DDSPDS			RC 22
203.00	SPDS DISPLAYS - COLOR SCHEME oPUMP/VALVE - RED = ON/OPEN, GREEN = OFF/CLOSED oRATE OF CHANGE DATA - CYAN	NONE	2.1 DDSPDS			RC 22
204.00	SPDS USES REDUNDANT DATA POINTS TO CALCULATE AVERAGES. TABLE 2-2 REDUNDANT POINTS	NONE	2.2.2 DDSPDS			RC 22
205.00	THE SPDS SEPARATELY VALIDATES SELECTED PLANT VARIABLES. RPV LEVEL, SRM, APRM, RPV PRESSURE, DRYWELL PRESS, SUPPRESSION POOL TEMP, SUPP POOL LEVEL	NONE	2.2.2 DDSPDS			RC 22

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206.00	SPDS VALIDATES SRM BY FIRST VERIFYING THAT THE SRM 'S ARE INSERTED.	NONE	2.2.2 DDSPDS			RC 22
207.00	THE VALIDATION CRITERIA FOR SPDS COMPUTED AVERAGES IS PRESENTED IN TABLE 2-3. THE CHARACTERIS "NV" APPEAR IN MAGNETA IN THE AFFECTED DISPLAY (BAR CHA RT, TREND OR X-Y PLOT, OR MIMIC) WHENEVER THE AVER AGE POINT FAILS TO MEET THE VALIDATION CRITERIA	0.10	2.2.2 DDSPDS			RC 22
208.00	***** DELETED *****	NONE				
209.00	FOR THE SPDS, THE CHARACTERS "DNSC" ARE DISPLAYED IN MAGNETA IN THE AFFECTED BAR CHART WHENEVER THE DATA POINT DRIVING THE DISPLAY IS ASSIGNED A QUALI TY CODE OF "LRL" BY THE PMIS	NONE	2.2.3 DDSPDS			RC 22
210.00	GENERAL DISPLAY CHARACTERISTICS - THE SPDS WILL HA VE FOUR BASIC TYPES OF DISPLAYS PRESENTED IN THE G ENERAL AND GRAPHIC DISPLAY AREA (GGDA) OF THE SPDS DISPLAY TERMINAL SCREEN: BAR CHARTS, TREND PLOTS, MULTI-PARAMETER X-Y PLOTS AND MIMICS	NONE	2.3 DDSPDS			
211.00	A UNIQUE TITLE APPEARS IN LARGE PRINT AT THE TOP O F THE GGDA FOR EACH SPDS DISPLAY	NONE	2.3 DDSPDS			RC 31
212.00	BAR CHART CHARACTERISTICS - THE SPDS DISPLAY COLOR FILL OF THE HORIZONTAL OR VERTICAL BAR IS DETERMI NED BY THE QUALITY CODE OF THE DATA POINT WHICH IS USED TO DRIVE THE BAR - 2.1	NONE	2.3.1A DDSPDS 2.2.3 DDSPDS			

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213.00	SPDS DATA BASE CONSTANTS ARE USED TO DEFINE WARNIN G AND ALARM POINTS FOR EACH DATA POINT, AND MAY BE REDEFINED FOR EACH PLANT OPERATING MODE, RUN, STARTUP/HOT STANDBY, SHUTDOWN, REFUEL	NONE	2.3.1.B DDSPDS			RC 21
214.00	DIGITAL CURRENT VALUE AND RATE-OF-CHANGE ARE DISPL AYED ADJACENT TO EACH BAR, WITH DECIMAL PLACES AS PER THE DATA BASE DEFINITION OF THE ASSOCIATED DATA POINTS	NONE	2.3.1C DDSPDS			RC 20 & 23
215.00	A DIRECTION-OF-CHANGE INDICATOR IS PROVIDED ADJACE NT TO THE DITITAL RATE-OF-CHANGE VALUE. "UP" ARROW = POSITIVE RATE-OF-CHANGE; "DOWN" ARROW = NEGATIV E RATE-OF-CHANGE. NO ARROW = ZERO RATE-OF-CHANGE	NONE	2.3.1D DDSPDS			RC 23
216.00	BAR CHARACTERISTICS - SPECIFIC LOCATIONS RELATIVE TO BAR - HORIZONTAL/VERTICAL - NAME OF PLANT VARI ABLE LEFT/ABOVE; MAX-MIN BAR VALUES UNDER/LEFT LEFT EDGE; REGULARLY SPACED, WARNING AND HIGH ALAR M TIC MARKS UNDER/LEFT EDGE; CURRENT DIGITAL VALUE RIGHT/ABOVE; RATE OF CHANGE VALUE AND ARROW RIGHT OF CURRENT VALUE/NEAR CURRENT VALUE; DOWNSCALE IND ICATOR (DNSC) MAGNETA LEFT END/UNDER * SOME EXCEPTIONS	NONE	2.3.1.1A-G DDSPDS 2.3.1.2A-G DDSPDS			RC 23
217.00	SPDS TIME PLOT CHARACTERISTICS - A PLANT VARIABLE IS ASSIGNED TO THE Y AXIS AND TIME IS ASSIGNED TO THE X AXIS OF THE DISPLAY FOR TREND PLOTS	NONE	2.3.2A DDSPDS			
218.00	THE TIME AXIS COVERS A 10 MIN. TIME PERIOD WITH TH E CURRENT VALUE AT THE RIGHT HAND EDGE LABELED "0" & THE 10 MIN. OLD DATA SCROLLING OFF THE LEFT LAB ELED "-10" WITH IN BETWEEN DATA LABLED -1 TO -9	NONE	2.3.2B DDSPDS			RC 32

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CAPABILITIES MATRIX

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
219.00	THE Y AXIS VARIABLE IS SHOWN TO THE LEFT OF THE TR END PLOT AND ITS DIGITAL CURRENT VALUE, RATE OF CH ANGE, AND DIRECTION OF CHANGE ARE SHOWN TO RIGHT	NONE	2.3.2C DDSPDS			RC 20
220.00	MAX. AND MIN. VALUES OF THE Y AXIS ARE SPECIFIED F OR EACH VARIABLE FOR THE TREND PLOT AND ARE THE SA ME VALUES SHOWN IN CORRESPONDING BAR CHART.	NONE	2.3.2D DDSPDS			
221.00	REGULARLY SPACED TIC MARKS OR TIC MARKS AND VALUES FOR WARNING OR ALARM LIMITS ARE SHOWN ALONG THE L EFT HAND EDGE OF THE TREND PLOT	NONE	2.3.2E DDSPDS			
222.00	THE COLOR OF THE TREND LINE IS ALWAYS CYAN	NONE	2.3.2F DDSPDS			
223.00	WHEN A DATA POINT FAILS ITS VALIDATION CHECK, THE CHARACTERS "NV" ARE DISPLAYED IN MAGNETA NEAR THE CURRENT VALUE	NONE	2.3.2G DDSPDS			
224.00	THE MOVING CURSOR WILL TRACK ALONG ONE AXIS OF THE DISPLAY FOR DOWNSCALE INDICATIONS. THE DOWNSIDE INDICATOR IS NOT USED.	NONE	2.2.3 DDSPDS 2.2.3.H DDSPDS			
225.00	MULTI-PARAMETER X-Y PLOT CHARACTERISTICS - PLANT V ARIABLES ARE ASSIGNED TO BOTH X AND Y AXIS AND THE CURRENT DIGITAL VALUE OF EACH VARIABLE IS DISPLAY ED ADJACENT TO THE RESPECTIVE AXIS	NONE	2.3.3A DDSPDS			
226.00	MAX. & MIN. VALUES OF THE AXIS ARE SPECIFIED	NONE	2.3.3B DDSPDS			

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227.00	ONE OR MORE MULTI-PARAMETER LIMIT CURVES MAY BE INCLUDED ON EACH XY PLOT	NONE	2.3.3C DDSPDS			
228.00	A SPECIAL SYMBOL IS USED TO INDICATE THE CURRENT STATE OF F (X,Y) ON THE XY PLOT AND PROXIMITY TO LIMIT CURVES	NONE	2.3.3D DDSPDS			
229.00	A TAIL IS RETAINED ON THE DISPLAY TO SHOW THE VARIATION OF F (X,Y) OVER THE PRECEEDING 10 MINUTE PERIOD - THE TAIL IS NOT INDEXED	NONE	2.3.3E DDSPDS			RC 32
230.00	THE COLOR OF THE SPECIAL SYMBOL AND THE TAIL IN THE XY PLOT IS ALWAYS CYAN.	NONE	2.3.3F DDSPDS			
231.00	WHEN A DATA POINT FAILS ITS VALIDATION CHECK, THE CHARACTERS "NV" ARE DISPLAYED IN MAGNETA NEAR THE CURRENT VALUE ON THE XY PLOT	NONE	2.3.3G DDSPDS			
232.00	THE MOVING CURSOR WILL TRACK ALONG ONE AXIS OF THE DISPLAY FOR DOWNSCALE INDICATIONS - THE DOWNSCALE INDICATOR IS NOT USED	NONE	2.2.3 DDSPDS 2.3.3H DDSPDS			
233.00	MIMIC DISPLAY CHARACTERISTICS - SPDS MIMIC DISPLAYS SHALL BE GRAPHIC REPRESENTATIONS OF REACTOR PLANT OR SAFETY SYSTEMS. MIMIC DISPLAYS MAY INCLUDE - BAR CHARTS WITH SAME CONVENTIONS AS NOTED BEFORE, -COMPONENT STATUS (VALVES, DAMPERS OPEN; PUMPS, FANS OPERATING = RED ;; OPPOSITE STATE: GREEN)	NONE	2.3.4 A&B DDSPDS			

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PROJECT: NPPD - PNIS

V&V TEAM LEADER: A.F.LEXA

V&V TEAM MEMBERS: B.D.PAUL
B.S.PAUL
J.H. McCLESKEY

ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
234.00	SPDS DATA REQUIREMENTS - ALL SPDS DATA IS PRESENTED IN TABLE 2-1 AND IS ONE OF THE FOLLOWING DATA TYPES - A, D, AMAX, AAVG, LOG, TRAN, BOOL, OR EXTR	NONE	3.1 DDSPDS			
235.00	SPDS DATA POINTS (1) DRIVE BAR, TREND, ONE AXIS OF AN X-Y PLOT OR DIGITAL VALUE (2) CALCULATE ANOTHER POINT (3) DRIVE STATUS INDICATOR. SEE TABLE 3-1	NONE	3.1 DDSPDS			
236.00	SPDS REDUNDANT FIELD POINTS SHOULD BE TERMINATED TO DIFFERENT MULTIPLEXERS WHEN MULTIPLEXERS ARE POWERED FROM DIFFERENT POWER SOURCES WHEN AVAILABLE. REDUNDANT POINTS TERMINATED TO THE SAME MULTIPLEXER SHOULD BE CONNECTED TO DIFFERENT TERMINATION BOARDS * NOTE: THIS IS A HARDWARE REQUIREMENT	NONE	3.2 DDSPDS			RC 26
237.00	WARNING & ALARM LIMITS FOR KEY PLANT VARIABLES - THE WARNING LIMITS, ALARM LIMITS, AND TIC MARKS FOR ALL SPDS DISPLAYS ARE LISTED IN TABLE 4-1	NONE	4.0 DDSPDS			
238.00	SUMMARY OF SPDS WARNING AND ALARM LIMITS IS LISTED IN TABLE 4-2	NONE	4.0 DDSPDS			
239.00	SFI - GENERAL - ALL SPDS DISPLAYS INCLUDE IN THE SPDS STATUS AREA (SSA) THE FIVE BASIC SAFETY FUNCTION INDICATORS (SFIs) OF REACTOR ACITVITY, CORE COOLING, COOLANT SYSTEM INTEGRITY, CONTAINMENT INTEGRITY AND RADIOACTIVE RELEASE	0.10	5 DDSPDS			
240.00	THE SFIs ARE SHOWN AS INDIVIDUAL BOXES ALONG THE BOTTOM OF EACH SPDS DISPLAY, WITH GREEN COLOR FILL FOR NORMAL CONDITIONS. YELLOW COLOR FILL FOR A WARNING CONDITION AND RED COLOR FILL FOR ALARM CONDITION, A MAGNETA COLOR FILL FOR QUESTIONABLE	NONE	5 DDSPDS			

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PROJECT: NPPD - PMIS

V&V TEAM LEADER: A.F. LEXA

V&V TEAM MEMBERS: B.D. PAUL
B.S. PAUL
J.H. McCLESKEY

ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
241.00	THE STATUS OF THE SAFETY FUNCTION INDICATORS ARE C ONTROLLED BY THE FOLLOWING EXTERNAL (REAL) DATA PO INTS: REACTIVITY-SPDSBOX1; CORE COOLING-SPDSBOX2; COOLANT SYSTEM INTEGRITY-SPDSBOX3; CONTAINMENT INT EGRITY-SPDSBOX4; RADIOACTIVE RELEASE-SPDSBOX5.	NONE	5 DDSPDS			
242.00	REACTIVITY SFI (SPDS BOX 1) LOGIC FOR COLOR FILL D EFINED IN SECTION 5.1	NONE	5.1 DDSPDS			RC 30
243.00	CORE COOLING SFI (SPDS BOX 2) LOGIC FOR COLOR FILL DEFINED IN SECTION 5.2	NONE	5.2 DDSPDS			
244.00	COOLANT SYSTEM INTEGRITY SFI (SPDS BOX3) LOGIC FOR COLOR FILL DEFINED IN SECTION 5.3	NONE	5.3 DDSPDS			
245.00	CONTAINMENT INTEGRITY SFI (SPDS BOX4) LOGIC FOR CO LOR FILL DEFINED IN SECTION 5.4	NONE	5.4 DDSPDS			
246.00	RADIOACTIVE RELEASE SFI (SPDS BOX5) LOGIC FOR COLO R FILL DEFINED IN SECTION 5.5	NONE	5.5 DDSPDS			
247.00	ESI's - SPDS USES ESI'S TO REPORT STATUS OF IMPORT ANT SYSTEMS FROM DIGITAL DATA POINTS OR EXTERNAL R EALS. SECTION 6.1 DEFINES THE FOLLOWING EXTR- SPD S0010, 0039,0040,0041,0042,0050,0054,0080,0085,008 6,0087 & 0088. SUMMARY IS IN TABLE 6-1 .	NONE	6.1 DDSPDS			
248.00	EOPSI's - SPDS USES EOPSI'S TO PROVIDE STATUS INFO RMATION IN RELATION TO MULTIPARAMETER LIMITS INCLU DED IN LEVEL 3 DISPLAYS. SUMMARY IN TABLE 6-2. (EX TR'S CALCULATION DETAILS IN SECTION 9)	NONE	6.2 DDSPDS			RC 34

PROJECT: NPPD - PMIS

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
249.00	DISPLAY L1.0 - TOP LEVEL SPDS DISPLAY (OVERVIEW) (1) FOUR HORIZONTAL BARS APRM, RPV PRESSURE, RPV LE VEL, DRY W. PRESS (2) BAR CHARACTERISTICS PER 7.1 AND TABLE 7-1 (3) ESI PER 7.2 (4) EOPSI PER 7.3 (5) PICTURE PER FIGURE 7-1	NONE	7.1-7.3 DDSPDS			RC 29
250.00	DISPLAY L2.1.1 - REACTIVITY CONTROL BAR - (1) CHAR ACTERISTICS PER 8.1 AND TABLE 7-1 (2) PICTURE PER FIGURE 8-2	NONE	8.1 DDSPDS			RC 27
251.00	DISPLAY L2.1.2 - REACTIVITY CONTROL TREND (1) CHAR ACTERISTICS PER 8.2 (2) PICTURE PER FIGURE 8-3	NONE	8.2 DDSPDS			
252.00	DISPLAY L2.2.1 REACTOR CORE COOLING (BAR/RPV MIMIC) (1) CHARACTERISTICS PER 8.3 AND TABLE 7-1 (2) PI CTURE PER FIGURE 8-5	NONE	8.3 DDSPDS			
253.00	DISPLAY L2.2.2 REACTOR CORE COOLING TREND - (1) CH ARACTERISTICS PER 8.4 (2) PICTURE PER FIGURE 8-6)	NONE	8.4 DDSPDS			
254.00	DISPLAY L2.3.1 REACTOR COOLANT SYSTEM INTEGRITY - (1) CHARACTERISTICS PER 8.5 AND TABLE 7-1 (2) PICT URE PER FIGURE 8-7.	NONE	8.5 DDSPDS			
255.00	DISPLAY L2.3.2 - REACTOR COOLANT SYSTEM INTEGRITY TREND (1) CHARACTERISTICS PER SECTION 8.6 (2) PIC TURE PER FIGURE 8-8	NONE	8.6 DDSPDS			
256.00	DISPLAY L2.4.1 - CONTAINMENT INTEGRITY BAR (1) CHA RACTERISTICS PER SECTION 8.7 AND TABLE 7.1 - (2) P ICTURE PER FIGURE 8-9	NONE	8.7 DDSPDS			RC 20

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PROJECT: NRPD - PMIS

V&V TEAM LEADER: A.F.LEXA

V&V TEAM MEMBERS: B.D.PAUL
B.S.PAUL
J.H. McCLESKEY

ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
257.00	DISPLAY L2.4.2 CONTAINMENT INTEGRITY TREND - (1) CHARACTERISTICS PER SECTION 8.8 (2) PICTURE PER FIGURE 8-10.	NONE	8.8 DDSPDS			
258.00	DISPLAY L2.4.3 SUPPRESSION CHAMBER MIMIC (1) CHARACTERISTICS PER SECTION 8.9 (2) PICTURE PER FIGURE 8-12	NONE	8.9 DDSPDS			RC 35
259.00	DISPLAY L2.5.1 RADIOACTIVITY CONTROL BAR (1) CHARACTERISTICS PER SECTION 8.10 AND TABLE 7.1 (2) PICTURE PER FIGURE 8-13	NONE	8.10 DDSPDS			RC 36
260.00	DISPLAY L2.5.2 - REACTIVITY CONTROL TREND (PAGE 1 OF 2) (1) CHARACTERISTICS PER SECTION 8.11 (2) PICTURE PER FIGURE 8-14	NONE	8.11 DDSPDS			RC 36
261.00	DISPLAY L2.5.3 - REACTIVITY CONTROL TREND (PAGE 2 OF 2) (1) CHARACTERISTICS PER SECTION 8.12 (2) PICTURE PER FIGURE 8-15	NONE	8.12 DDSPDS			RC 36
262.00	DISPLAY L3.1 SUPPRESSION POOL HEAT CAPACITY TEMPERATURE LIMIT (1) CHARACTERISTICS PER SECTION 9.1 (2) PICTURE PER FIGURE 9-1	NONE	9.1 DDSPDS			
263.00	DISPLAY L3.2 SUPPRESSION POOL HEAT CAPACITY LEVEL LIMIT (1) CHARACTERISTICS PER SECTION 9.2 (2) PICTURE PER FIGURE 9-2	NONE	9.2 DDSPDS			
264.00	DISPLAY L3.3 SUPPRESSION POOL LOAD LIMIT (1) CHARACTERISTICS PER SECTION 9.3 (2) PICTURE PER FIGURE 9-3	NONE	9.3 DDSPDS			

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PROJECT: NPPD - PMIS

V&V TEAM LEADER: A.F.LEXA

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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
265.00	DISPLAY L3.4 CONTAINMENT PRESSURE LIMITS (1) CHARACTERISTICS PER SECTION 3.4 (2) PICTURE PER FIGURE 9-4	NONE	9.4 DDSPDS			
266.00	DISPLAY L3.5 DRYWELL SPRAY INITIATION PRESSURE LIMITS (1) CHARACTERISTICS PER SECTION 9.5 (2) PICTURE PER FIGURE 9-5	NONE	9.5 DDSPDS			
267.00	DISPLAY L3.6 DRYWELL HYDROGEN AND OXYGEN DEFLAGRATION OVERPRESSURE LIMITS (1) CHARACTERISTICS PER SECTION 9.6 (2) PICTURE PER FIGURE 9-6	NONE	9.6 DDSPDS			
268.00	DISPLAY L3.7 SUPPRESSION CHAMBER HYDROGEN AND OXYGEN DEFLAGRATION OVERPRESSURE LIMITS (1) CHARACTERISTICS PER SECTION 9.7 (2) PICTURE PER FIGURE 9-7	NONE	9.7 DDSPDS			
269.00	DISPLAY L3.8.1 RHR PUMP NPSH LIMITS - (1) CHARACTERISTICS PER SECTION 9.8 (2) PICTURE PER FIGURE 9-8	NONE	9.8 DDSPDS			RC 33
270.00	DISPLAY L3.8.2 LPCS PUMP NPSH LIMITS - (1) CHARACTERISTICS PER SECTION 9.9 (2) PICTURE PER FIGURE 9-10	NONE	9.9 DDSPDS			RC 33
271.00	DISPLAY L3.9 HIGH HEAD PUMP NPSH LIMITS - (1) CHARACTERISTICS PER SECTION 9.10 (2) PICTURE PER FIGURE 9-10.	NONE	9.10 DDSPDS			RC 33
272.00	DISPLAY L3.10 BORON INJECTION INITIATION TEMPERATURE LIMITS - (1) CHARACTERISTICS PER SECTION 9.11 (2) PICTURE PER FIGURE 9.11	NONE	9.11 DDSPDS			

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PROJECT: NPPD - PMIS

V&V TEAM LEADER: A.F.LEXA

V&V TEAM MEMBERS: B.D.PAUL
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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
273.00	DISPLAY L3.11 RPV SATURATION TEMPERATURE LIMIT - (1) CHARACTERISTICS PER SECTION 9.12 (2) PICTURE PE R FIGURE 9-12	NONE	9.12 DDSPDS			
274.00	DISPLAY L3.12 - MAXIMUM CORE UNCOVERY TIME LIMIT (1) CHARACTERISTICS PER SECTION 9.13 (2) PICTURE PE R FISURE 9-13.	NONE	9.13 DDSPDS			
275.00	DISPLAY L3.13 ALTERNATE SHUTDOWN COOLING AND RPV F LOODING PRESSURE LIMITS (1) CHARACTERISTICS PER SE CTION 9.14 (2) PICTURE PER FIGURE 9-14	NONE	9.14 DDSPDS			
276.00	DISPLAY L3.14 ALTERNATE RPV FLOODING PRESSURE LIMI T (1) CHARACTERISTICS PER SECTION 9.15 2 PICTURE P ER FIGURE 9-15	NONE	9.15 DDSPDS			
277.00	DISPLAY L3.15 RPV PRESSURE/LEVEL STATUS MATRIX (1) CHARACTERISTICS PER SECTION 9.16 (2) PICTURE PER FIGURE 9-16	NONE	9.16 DDSPDS			
278.00	THE BASIC CRT SCREEN FORMAT USED FOR THE SPDS CONT AINS OP. COM. AREA (OCA), CURRENT DATE AND TIME AR EA (CDTA), SP. ALARM AREA (SSA), GENERAL GRAPHIC AND DISPLAY AREA (GGDA), SAFETY FUNCTION INDICATOR (SFI), AND FUNCTION KEY AREA	NONE	1.3-FIG1-5 DDSPDS			
279.00	THROUGH 299.00 * INTENTIONALLY LEFT BLANK * **********	NONE				
300.00	F-SPEC - PMIS SUBSYSTEM MAN-MACHINE EXECUTIVE SUBS YSTEM CONTROLS THE DISPLAY TASK FLOW, UPDATE SPDS SAFETY PARAMETER BLOCKS ON EACH SPDS DISPLAY EACH SECOND	NONE	1.2.6(284) FSPEC-RA			

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PROJECT: NPPD - PMIS

V&V TEAM LEADER: A.F.LEXA

V&V TEAM MEMBERS: B.D.PAUL
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ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
301.00	SPDS SUBSYSTEM WILL CONTAIN ALL DISPLAYS & COMPUTATIONS, WILL DEFINE DISPLAYS & PARAMETERS, AND IS EXECUTED UNDER THE CONTROL OF THE MAN-MACHINE INTERFACE SUBSYSTEM	NONE	1.2.10 FSPEC-RA			
302.00	THE SOFTWARE SUPPORT SERVICES SUBSYSTEM PROVIDES GENERAL PURPOSE DATA CONVERSION FOR PMIS, SPDS AND NSS - E.G. ASCII TO REAL	NONE	1.2.13.1 FSPEC-RA			
303.00	THE SOFTWARE SUPPORT SERVICES SUBSYSTEM PROVIDES GENERAL PURPOSE SUBPROGRAMS SUCH AS POINT VERIFICATION, VALUE EXTRACTION, QUALITY EXTRACTION, DESCRIPTION EXTRACTION, HIGH AND LOW ALARM LIMITS AND CURRENT TIME AND DATE - FOR PMIS, SPDS, AND NSS	NONE	1.2.13.2 FSPEC-RA			
304.00	THE SOFTWARE SUPPORT SERVICES SUBSYTEM PROVIDES GENERAL PURPOSE MATHEMATICAL SUBPROGRAMS - SUCH AS STEAM TABLES, LEAST SQUARE CURVE FIT AND STANDARD DEVIATION FOR PMIS, SPDS AND NSS	NONE	1.2.13.3 FSPEC-RA			
305.00	THE SOFTWARE SUPPORT SERVICES SUBSYSTEM PROVIDES GENERAL PURPOSE GRAPHICS SUBPROGRAMS SUCH AS FOREGROUND/BACKGROUND STATIC PLANE, GRAPHICS COLOR, DRAW BOX, CIRCLE AND CLEAR CURSOR FOR PMIS, SPDS AND NSS	NONE	1.1.13.4 FSPEC-RA			
306.00	THE FUNCTION KEY ASSIGNMENT ALLOWS THE USER, WITH PRIVILEGE LEVEL, TO ATTACH A DISPLAY TO PARTICULAR KEY. EACH IDT CONSOLE MAY BE CONFIGURED WITH DIFFERENT FUNCTION KEY ASSIGNEMENTS	62.00	2.11.1.2 FSPEC-RA 3.2.2 FSPEC-RA			RC 19
307.00	THE ABILITY TO INCORPORATE A DISPLAY INTO A HIERARCHICAL DISPLAY STRUCTURE, WHERE A TOP DISPLAY CONTAINING SUMMARY INFORMATION ON MORE DETAILED INFORMATION; THE LOWER LEVEL DISPLAY CAN, IN TURN, REFERENCE LOWER, MORE DETAILED DISPLAYS	63.00	2.11.1.3 FSPEC-RA			RC 19

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PROJECT: NPFD - PMIS

V&V TEAM LEADER: A.F.LEXA

V&V TEAM MEMBERS: B.D.PAUL
B.S.PAUL
J.H. McCLESKEY

ITEM NUMBER	SYSTEM CAPABILITY	SYSTEM REQMTS NUMBER	S/W DESIGN REFERENCE	INTEG/ VALID TEST NUMBER	VALID TEST RESULTS NUMBER	OPEN RC/ DISCREP REPORT NUMBER
308.00	THE DISPLAYS MAY BE ACCESSED DIFFERENT WAYS: BY MA NUALLY ENTERING THEIR "TURN-ON" CODES DIRECTLY FRO M THE HELP MENU, AND THROUGH THE HIERARCHICAL STRU CTURE. THE IDT COLOR-GRAPHIC TERMINALS HAVE FOUR ARROW KEYS: UP, DOWN, LEFT, AND RIGHT. THESE KEYS MAY BE USED TO MOVE UP, DOWN, AND ACROSS, THROUGH HIERARCHICAL DISPLAYS	63.00	2.11.1.3 FSPEC-RA	8		RC 19
309.00	THE DATA CONCENTRATOR SUBSYSTEM COMMUNICATES WITH EACH REMOTE MULTIPLEXER VIA HIGH SPEEDFIBER OPTIC LINK (HARDWARE REQUIREMENT)	147.00	1.1.1 FSPEC-RA			
310.00	THROUGH 399.00 * INTENTIONALLY LEFT BLANK * **********	NONE				
400.00	SPDS SAFETY ANALYSIS - THE SPDS WILL ACCOMPLISH IT S PURPOSE BY PROVIDING CONTROL ROOM PERSONNEL WITH DISPLAYS RELATED TO THE FOLLOWING PLANT SAFETY FU NCTIONS WHICH HAVE BEEN IDENTIFIED IN NUREG-0737, SUPP.1 (1) REACTIVITY CONTROL (2) REACTOR CORE COO LING AND HEAT REMOVAL FROM THE PRIMARY SYSTEM (3) REACTOR COOLANT SYSTEM INTEGRITY (4) CONTAINME NT CONDITIONS (5) RADIOACTIVITY CONTROL	26.00	1.1 SPDSSA-RO			
401.00	THE SPDS WILL PROVIDE THE FOLLOWING INFORMATION BY THE BWROG EPGS (1) DETERMINE THE EXISTENCE OF AN EPG ENTRY CONDITION FROM A NORMAL POWER OPERATING PLANT STATE, (2) DETERMINE THE NEED TO TRANSFER TO , OR IMPLEMENT CONCURRENTLY, A DIFFERENT PART OF T HE EPGS (OR OTHER PLANT PROCEDURES) AFTER INITIAL ENTRY INTO THE EPGS (3) ESTABLISH PROXIMITY TO MUL TIPLE-PARAMETER LIMIT CURVES OR DECISION POINTS SP ECIFIED IN THE EPGS	0.10	3.2 SPDSSA-RO			

APPENDIX B

Validation Forms

VALIDATION TEST LOG	DATE:	LOCATION:	SEQUENTIAL PAGE NO.:
TEST PROCEDURE NO.:		TEST PROCEDURE TITLE:	

DESCRIPTION OF TEST:

COMMENTS/OBSERVATION:

REPORTED BY:

(V&V Team To Keep Original Sheets In 3-Ring Binder)

REVIEWER'S COMMENT	SERIAL NO.:
PROJECT: NPPD V&V	DATE:
V&V TASK: VALIDATION TESTING	ISSUED BY:

DOCUMENT(S) UNDER REVIEW:

QUESTION OR ANOMALY:

COMMENTS:

DISTRIBUTION: QA
DEVELOPMENT TEAM
NPPD REPRESENTATIVE

	DISCREPANCY REPORT	SERIAL NO.:	DATE:
	PROJECT: NPPD V&V	PREPARED BY: SIGNATURE:	DATE:
PART 1	V&V TASK: VALIDATION TESTING	REVIEWED BY: SIGNATURE:	DATE:
	DOCUMENT(S) WHERE DISCREPANCY EXISTS:		
	DESCRIPTION OF DISCREPANCY:		PAGE ___ OF ___
	ESTIMATE OF IMPACT:		
PART 2	RESOLUTION ACTION:		
		ISSUED BY:	DATE:
PART 3	DISCREPANCY RESOLVED	INITIAL / POSITION: V&V TL / DATE	
	COMMENTS:		

SAIC-364:9/84:2.2:1