PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION UNIT 1

NPF-39

DOCKET NO: 50-352

SUMMARY OF THE VALIDATION PROGRAM

FOR THE

SAFETY PARAMETER DISPLAY SYSTEM

FEBRUARY 24, 1986

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1. SUMMARY

This report presents salient results of evaluations performed for the Philadelphia Electric Company in validating the operability of the installed Limerick Generating Station, Unit 1 Safety Parameter Display System (SPDS). Verified tests and analyses completed during the Limerick Unit 1 power ascension program have shown that functional, performance and interface design requirements placed on the SPDS by PECo and GE have been met, thereby demonstrating that the SPDS performs as designed over the full range of reactor power levels. Based on these results it is concluded that the SPDS is properly installed and is capable of functionally performing as required in the plant environment. The Limerick SPDS is consistent with the General Electric SPDS described in the report "Licensing Topical Report for General Electric Emergency Response Information System" (Reference 1) and is considered to be operable.

2. SCOPE/OBJECTIVE

The purpose of this report is to document the plant specific validation of the Real Time Analysis and Display (RTAD) portion of the Emergency Response Facility Data System (ERFDS) that was completed for Limerick Generating Station Unit 1. The RTAD portion of ERFDS includes those functions defined in NUREG 0737 Supplement 1 as required for a Safety Parameter Display System (SPDS). The hardware and software used in the Limerick ERFDS was essentially the same as that used in the General Electric Generic Emergency Response Information System (ERIS) described in the General Electric Generic ERIS Licensing Topical Report (Reference 1). General Electric provided documentation of the Generic ERIS System Software Validation Program for SPDS (Reference 2) to the Nuclear Regulatory Commission (NRC) and the NRC has approved the generic application of GE ERIS to specific plants (Reference 3) provided the plant specific validation effort has been demonstrated satisfactorily. This report was prepared as an extension of Reference 2 for the plant specific validation of the Limerick SPDS.

In order to perform this validation an extensive ERFDS startup test program has been performed. The purpose of this startup test program was to verify that the Limerick ERFDS software, data bases, and hardware have been correctly installed, set up and calibrated. The program also ensures that certain data needed from plant operation has been incorporated into the plant specific data bases. Together these tests verify that the system as a whole meets the design requirements for ERFDS and performs within the limits specified in the Startup Test Procedure. The test methods used for the ERFDS startup test were the same as used for other NSSS system startup tests, i.e. there are pre-established acceptance criteria, approved procedures, and sign-off for accomplishment of each step and result obtained. This startup test program validated the ERFDS functions incorporated within the following displays (these displays constitute SPDS):

Critical Plant Variables

RPV Control (Power)

RPV Control (Temp)

Containment Control (Pool Level)

2 Dimensional Plots

Trend Plots

Validation Displays

3. SITE SPECIFIC VALIDATION ACTIVITIES

3.1 SUMMARY

This section of the report describes the validation activities accomplished at Limerick for SPDS. The subjects discussed in this section include validation of the data base, integration tests repeated at the site following installation of software, and the extensive startup test program. Most of the activities were performed in series with some significant overlap and/or repeat testing. Each time new software was installed at the Limerick site the integration test which was performed at General Electric was repeated on the Limerick software. While data base validation was accomplished prior to the startup tests, some changes to and revalidation of the data bases during startup testing was required.

3.2 SITE VALIDATION OF DATA BASES

Data base validation was done in several stages depending on the characteristics of the data base and the origin of the data input. General Electric, San Jose, provided data base input based on design specifications or system engineering analysis. Limerick site personnel input data based on hardware characteristics, instrumentation calibration and plant specific engineering analysis. All of these inputs then were verified on-site by comparison with the input base documentation on a point-by-point basis.

The data base and SPDS displays were reviewed by two GE system specialists during the time the plant was at 5% power. The review of approximately 900 system composed points and 1500 display outputs led to the changes of approximately 60 composed points and constants principally due to signal inversion or corrections to equations for plant specific configurations. Corresponding changes were made to the displays and Display Parameter Lists (DPL's). At this same time field input problems were identified which included out-of-range, out-of-calibration, or out-of-commission signals which were corrected.

An on-site procedure, "Procedure To Control Changes Made To 'The Emergency Response Facility Data System (ERFDS)' Data Base and Application Software", has been put in effect to establish the requirements for documenting changes to the data base and software.

Site calibration activities provided input to the data bases in the form of signal identification, signal characteristics, and signal conversion constants. Calibration activities were performed in two stages. The first stage consisted of verifying the setup of the SPDS data acquisition hardware and correlating software databases and the calculation of conversion constants. Test signals were applied to the input terminals of the data acquisition system to perform this activity. The second stage of the calibration process consisted of loop checking the inputs. This involved operating plant equipment (where possible), simulating the operation of plant equipment, or simulating real world inputs to the instrument loop transmitters. Conversion constants were recalculated if necessary during this activity. Whenever it was necessary to prove an input in a segmented fashion, care was taken to be certain that the segments overlapped. Testing was generally done by operating the source of the SPDS input. Simulation was used to prove a part of the electrical circuit only after it had been proven that operation of the source caused a response identical to the simulation. The methodology used to calibrate SPDS inputs is similar to that used for all other plant system instrumentation.

The final validation of the data bases was performed as a prerequisite for starting the startup tests with the exception of the validation of those constants which required plant power to fine tune and validate. These prerequisite system tests are described in Section 3.3.

The SPDS system is designed to be fine tuned to reflect plant specific parameters accurately on the appropriate displays. During plant testing at Test Condition 6, the SPDS startup test tracked several plant startup test procedures in order to obtain performance data. The inclusion of this information into the data base provided fine tuning for the system displays and provides the operator/user the most accurate information possible. The following is a brief description of the most important constants which were recalculated.

- A core flow compensation factor used for adjusting the wide range level instrument readings for pressure differences across the taps. These velocity head effects on the taps change with flow.

- The reactor thermal power constant (used in the reactor power algorithm) that encompasses the influencing dynamics other than steam and feedwater enthalpy and feedflow. This constant allows for a reasonable correction for CRD flow, reactor water clean-up, ambient losses and reactor recirc pump energy/ efficiency.

- Another core flow compensation factor used for differences in lower plenum flow and effects on bottom drain flow used as an input to RPV temperature.

- A backflow constant which is used to correct for flow conditions associated with one recirc pump operation.

As a result of the above validation activities and the confirmation provided by the startup test it is concluded that the data bases have been totally validated. Changes to the data base have been made in a controlled manner and a procedure exists to maintain proper control of future data base changes.

3.3 STARTUP TESTS

The SPDS Startup Tests were conducted in accordance with a detailed procedure developed by Limerick site personnel. The purpose of the SPDS Startup Test is to verify that the basic SPDS software, hardware, data bases, and displays function as specified.

3.3.1 Test Verification Objectives

The startup test program is designed to provide verification of the following:

1. All prerequisite system checks have been completed and documented. Major prerequisite checks include:

   - Software integration test completed on site. (This is a repeat of the integration test performed on the software at GE, San Jose.)

- DAS hardware setup and corresponding data base verified.

- Composed point data base verified.

- Constant data base verified.

- Displays correctly registered into terminals.

2. The basic SPDS parameters have been observed to be consistent with associated plant hardwired instrumentation parameters.

3. The values displayed for the basic SPDS parameters have been shown to be consistent on all displays.

4. The values displayed for the basic SPDS parameters are consistent with hand calculations performed utilizing the same input values.

5. The specified constants have been redefined to reflect actual rated operating conditions.

3.3.2 Test Activities

The Limerick SPDS startup test program is designed to examine and verify the adequacy of six basic system features.

1. Composed Point Verification

This activity verifies that the composed points identified in the system design specification and needed to properly drive the SPDS displays, are in fact, loaded into the processor's data bases. In general this activity is a visual/clerical check.

2. Engineering Units Verification

This activity verifies that the engineering units actually used when calibrating SPDS signals agree with those in the system design specification I/O list. When discrepancies were found, changes were required in the point definition data base, and/or plant specific constants or the composed point list.

3. Plant Specific Constants Verification

This activity verifies that the plant specific constants identified in the system design specification and/or input by the site and needed to properly drive the displays, are in fact, loaded into the processors data bases. In general this activity was a visual/ clerical check.

4. Plant Specific Constant Recalculation

This test identifies those constants which need to have their values recalculated based on plant operation at the power which allowed the necessary direct measurements. This permits the actual final values instead of initial "best estimates" to be input to the data base.

5. Validated Parameter Verification

This test compares the calculated SPDS validated plant parameters with measured plant data. The comparison verifies that the processor's algorithms, plant specific constants, composed and measured point data bases have been correctly set up/installed. This comparison also verifies correct signal loop calibration. A two step approach confirmed that the algorithm was handled correctly and was appropriate for the condition it was intended to formulate. Hardcopies of the SPDS displays were made for documentation of values presented and, as appropriate, data sheets were filled out with the comparable control room and other indicator values. These results were then further reduced per the procedure to determine if the data sets were within specified limits of each other. In this manner the results had direct correlation to SPDS displays and were secondarily confirmed by hand calculation.

6. Event Target Verification

This test verified that SPDS event targets correctly reflect actual plant conditions. The comparison validated important composed point data bases and signal loop calibration.

3.3.3 Test Acceptance Criteria

Acceptance criteria were as follows:

1. All SPDS validated data must agree with hardwired plant instrumentation within ±3% (of full scale of the plant instrument).

2. All SPDS validated data on the various SPDS displays (taken as near simultaneously as possible) must agree with each other within a two sigma deviation.

3. SPDS event targets (e.g., Safety Relief Valve, MSIV, Scram) must agree with plant status.

4. A hand calculation of the "validated" parameter resulting from the system validation function (e.g. reactor water level) must agree with the displayed value within ±0.5% of full range.

3.3.4 Startup Test Discussion and Results

The Startup Tes. verified that the data bases accurately reflect the hardware configuration of the front end data acquisition system by documenting the calibration and loop checking of all SPDS signals and by comparing the data bases with system elementaries. Steps also verified that the data bases accurately reflect the composition of the basic SPDS parameters by checking them against design specification and design record file documents.

The Startup Test demonstrated that the analog parameter algorithms function correctly and meet the acceptance criteria described in Section 3.3.3.

The Startup Test demonstrated that event targets and status flags function correctly. Trend plots and X-Y plots were checked to assure proper positioning of the cursor for the given conditions.

Color for all display parameters were checked for proper operation.

The SPDS startup test was performed at various plant power level conditions in conjunction with the plant startup tests. Conditions include; Startup Test Condition 6 (100% power), cold shutdown, heatup, low pressure, IRM/APRM overlap and Startup Test Condition 3.

A portion of the test was specifically designed for constants calculation and fine tuning. During Test Condition 6, significant plant cycles were tracked in order to take data, insert constants corrections and make the displays portray the plant as accurately as possible.

The procedure contained sign-off and date requirements for recording completion of each step. Summary results were recorded in the procedure with backup hard copies, data sheets, etc. filed in appropriate permanent files. Examples of the data sheets are contained in Appendix B. Upon completion of the startup test all of the data bases were reviewed and any changes since test initiation were verified as documented in accordance with the on site procedure, "procedure to control changes made to 'the Emergency Response Facility Data System (ERFDS)' data base and application software."

3.4 SUMMARY RESULTS OF SITE VALIDATION ACTIVITIES

The SPDS system is designed to be tuned (constant changes) to plant specific conditions. Accordingly, startup tests were run and corrections to constants made until the SPDS parameters met the requirements specified or it was determined that a software problem report (SPR) was required. Test procedure problems were documented and resolved in accordance with an established test exception procedure. No significant software problems are outstanding for the system. The SPDS startup test results demonstrate that the Limerick SPDS is operational and all acceptance criteria have been met.

4. PROBLEMS ENCOUNTERED AND RESOLUTION IMPLEMENTED

The problems encountered can be grouped into hardware problems and software problems. Both groups of problems are documented and controlled using the same standard procedures used for all GE supplied plant systems. Field Disposition Instruction (FDI) and Field Deviation Disposition Request (FDDR) documents are used to control actions to resolve both hardware and software problems.

4.1 HARDWARE PROBLEMS ENCOUNTERED

Some hardware failures were observed and corrected as discussed below.

4.1.1 Data Acquisition System (DAS) Hardware

Failed DAS hardware units were returned to the supplying vendor via FDDR for rework. These hardware units underwent the same quality assurance tests as applied to original hardware upon completion of rework at the vendor. The oper quality assurance documents are prepared for this reworked hardware.

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Types of DAS hardware failures encountered have been normal failures as would be expected with the electronic hardware involved. Early failures were due to misuse or misapplication, shipping damage, firmware revisions required, or manufacturing process breakdown. Most of these failures have been resolved by training and experience. The number of hardware units returned for apparent malfunction (early returns included some units which had not failed) dropped significantly in the later stages of the installation and test program.

4.1.2 Computer Hardware

A service contract has been established with the computer hardware supplying vendor for on site repair and service of the computer hardware. The hardware failures encountered to date have all been routine problems as would be expected for similar equipment.

4.1.3 Other Hardware

4.1.3.1 Auxiliary Hardware

The Intelligent Display Terminal hardware is handled in the same manner as the DAS hardware with failed units being returned to the supplying vendor. Service contracts for on-site service are in effect for printer-plotter hardware. Failures encountered with the above hardware have been routine, as expected type failures.

4.1.3.2 Battery Voltage Inputs

ERFDS monitors the voltages of all the battery banks which collectively make up the Safeguard DC power system. The initial design brought the battery bank voltages (nominally 125 VDC) directly into the ERFDS input modules. This design was found to create a potential for inaccurate measurement and equipment damage due to the following:

> Each input to the ERFDS analog input module consists of a signal high, a signal low, and a channel guard. Each ERFDS input module contains protective circuitry which begins to function when the voltage difference between the signal low and module ground equals ± 50 VDC. The operation of this circuitry is such that a voltage measurement error occurs when this circuitry is functioning. The measurement error increases as the difference between the input signal low and the module ground exceed ± 50 VDC. If the voltage difference between the input signal low and the module ground is great enough, the ERFDS input module could be damaged. Since the battery banks are purposely ungrounded, the voltage difference between the module signal low input and ground can be anywhere in the range of 0 to ± 140 VDC.

This problem was corrected by installing suitably qualified transducer/isolators between the battery voltages and the ERFDS input modules. The output of the transducer/isolators is 1-5 VDC. The isolator signal low output line which is connected to the ERFDS signal low input is grounded thereby alleviating the above problem.

4.1.3.3 Suppression Pool Water Level Indication

The initial ERFDS design had two inputs for suppression pool water level, each originating from redundant wide range suppression pool level instrumentation. This arrangement provided inaccurate level indication on the SPDS displays when the suppression pool cleanup pump was in operation due to the following:

> The tap for the wide range suppression pool level instrumentation is off the suppression pool cleanup pump suction line. When this pump is running, a six to twelve inch low error is introduced to the indicated level due to flow induced pressure losses in the suction line. At times, this would erroneously put the SPDS primary containment status flag in alarm when suppression pool cleanup was in operation.

In order to correct this problem, two inputs from the redundant narrow range suppression pool level instrumentation were input to ERFDS. The narrow range instrumentation is not affected by the operation of the suppression pool cleanup pump. The wide range suppression pool level inputs remain in ERFDS to provide level indication when the narrow range instrumentation is out of range.

4.1.4 Outstanding Hardware Issues

"GROUP NOT ISOL" Event Target

The "Group Not Isol" event target on the GE ERIS SPDS displays provides the operator with a summary status of containment isolation. The signals used to determine whether successful containment isolation has been achieved are the valve positions of the automatically initiated containment isolation valves. The isolation command signals of each containment isolation valve group are used to trigger the event target algorithm. The valve position status of all containment isolation valves are input to ERFDS. Modifications performed in the later stages of the plant design to the Nuclear Steam Supply Shutoff System logic caused reassignment of the isolation valve groupings and ultimately the creating of additional valve groups and isolation command signals. As a result of these modifications, isolation commands for five of the fourteen isolation valve groups are presently not in the ERFDS data base. The signals will be input to the ERFDS system during the Surveillance Test (ST) outage presently scheduled for May, 1986.

The "Group Not Isol" event target has been temporarily modified for human factors concerns in order to not mislead the operators during the period when all isolation commands are not present in the system. The event target is modified to direct the operator to the Containment Isolation Valve Group Summary Display format for assessment of containment isolation. This display enables the operator to assess containment isolation by providing a summary of valve position status for each valve group. This display is available to the operator via 1 keystroke. If the operator determines that a problem exists in a particular valve group, lower level displays are available on ERFDS which provide individual valve position status organized by valve group.

The event target modification is consistent with operator training on the use of the GE ERIS SPDS. The GE ERIS SPDS design requires the operator to utilize the Containment Isolation Valve Group Summary Display format in the event the "Group Not Isol" event target is declared "bad status" by the system. This occurs when the system detects as bad any of the inputs required for the event target algorithm.

The "Group Not Isol" event target will provide alarm indication on failure to isolate for those valve groups for which isolation command signals are in the ERFDS data base.

The modified "Group Not Isol" event target in conjunction with the Containment Isolation Valve Group Summary Display format provide the operator with a concise method of determining containment isolation status. The modification to the event target will be removed when the remaining isolation commands are installed and tested.

Display Terminal Overwrite

On occasion, personnel have witnessed what has been diagnosed as a display overwrite/refresh problem on the Intelligent Display Terminals. This problem is documented as an open SPR and is being investigated by GE. The problem occurs very infrequently, is recognizable, and can be cleared through the terminal's keyboard. This SPR does not significantly impact the functionality of the SPDS.

4.2 SOFTWARE PROBLEMS ENCOUNTERED

Software problem resolution was controlled in the same manner as that used for hardware with the exception that each software problem detected was documented in a Software Problem Report (SPR). Appendix A consists of several examples of typical SPRs which occurred during site validation with descriptions of corrective action taken. The SPRs were transmitted to General Electric for resolution via an FDDR. Software problems detected and resolved by Limerick site personnel were also documented by SPR and FDDR so that the resolution can be reviewed and approved by General Electric.

Revisions to the computer code to incorporate resolution of SPRs is transmitted by General Electric via FDI. The FDI provides an updated version of the software, closing all SPRs documented in the FDI. General Electric conducts full quality assurance testing (unit test, integration testing and QA testing) on the revised code before it is transmitted to Limerick. The FDI transmitting the revised code requires site testing to assure correct installation of the new software. Any new software problems found during this site testing were documented via SPR and transmitted to General Electric via an FDDR. FDDR's are also issued to document software changes implemented at the site between FDI software deliveries.

4.2.1 Major Resolved Software Problems

4.2.1.1 Historical Trend Plot Problems

General Electric discovered during execution of their V&V testing (documented in Reference 2) that the method used to calculate the historical portion of the trend plots did not meet performance criteria. The initial display of the historical portion of the trend was too slow. The software was originally designed to retrieve raw historical data, convert the data to composed data and then display it as historical trend data when the display requiring such data was called up on the screen. The Limerick software is improved by continuously storing the composed data in a buffer. When a display requiring historical data is called up, the software only needs to retrieve the appropriate buffer data. Performance is much enhanced and is satisfactory for the application.

4.2.1.2 Range Limit Problems

Initially it was possible, under certain conditions for the software (and thus SPDS displays) to report an instrument signal "out-of-range" when in fact the signal was just at its range limit. The result was some signals reported as "bad data" despite the fact that the instruments were perfectly normal and within normal accuracy. This "bad data" categorization at certain conditions prevented the validation of important parameters. This situation provided the operator with conservative results but deprived him of knowledge of actual plant conditions.

General Electric provided via FDI a revised code which allowed Limerick personnel to adjust the data bases to correct most of the problem signal points. The remaining signal points were corrected by recalibration or by adjusting the DAS hardware range settings.

4.2.1.3 Drywell Spray Initiation Pressure Limit Display

The Drywell Spray Initiation Pressure Limit 2-D plot display was supplied to the Limerick site with Suppression Pool Water Temperature as the Y-axis parameter rather than Suppression Pool Air Space Temperature. A review of the SPDS 2-D plot display against the Limerick Trip Procedures disclosed a discrepancy. The trip procedure requires the use of Suppression Pool Air Space Temperature. The discrepancy was resolved as follows: Suppression Pool Air Space Temperature was added to the ERFDS data base. The 2-D plot was reformatted to contain Suppression Pool Air Space Temperature as the Y-axis parameter.

4.2.2 Outstanding Software Issues

There are a few software problem reports (SPRs) that have not been resolved and/or incorporated into the current SPDS software. These have all been reviewed to assure that there are no open SPRs which significantly impact the functionality of the SPDS.

Among these SPRs is one which describes a very specific condition in which the top level display indication for containment isolation may indicate that isolation has not occurred when in fact one of a pair of isolation valves (inboard or outboard) has closed thereby providing isolation. The condition occurs only under the following circumstances:

a. One valve in a line (either inboard or outboard) has been either manually closed or automatically closed with subsequent reset of the isolation signal.

and

b. The remaining valve in the line then fails to close on receipt of an isolation signal.

Under all other conditions the event indication logic functions as designed to indicate isolation is achieved when one or more valves in a line is closed.

This SPR has been evaluated and determined to not be a significant functional problem. First, the indication is in the conservative direction and second, the operator has lower level displays readily available on ERFDS which would show one of the two valves in the line is closed and therefore isolation has been achieved. This software problem will be corrected at the earliest opportunity.

4.3 SUMMARY OF PROBLEMS AND RESOLUTIONS

Hardware problems encountered were considered routine and as anticipated for the type hardware involved. The DAS hardware and display terminals were returned to the vendors for rework if required. Repair of computer hardware was performed on site by the hardware vendor.

Software problems encountered included menu wording changes, site specific corrections, lower level coding errors and event flag function errors. These problems were also considered routine for the complexity of software being used. Four examples of Software Problem Reports (SPRs) of typical problems with resolution are included in Appendix A.

5. CONCLUSIONS

Based on the broadly scoped validation program that was conducted it is concluded that the Limerick SPDS is properly installed and performs as required in the plant environment. Problems that could have impacted the functional operation of the SPDS were identified and corrected. All segments of the entire system were examined and validated. The Limerick SPDS is consistent with the General Electric Generic SPDS described in the Report "Licensing Topical Report for General Electric Emergency Response Information System" (Reference 1) and is considered to be operable.

6. DEFINITIONS

ERFDS - Emergency Response Facility Data System. ERFDS is the title applied to the Limerick plant specific ERIS system. ERFDS includes RTAD and TRA functions. SPDS functions are included in the ERFDS RTAD.

RTAD - Real Time Analysis and Display System - RTAD is a collection of functional systems which provide plant parameter real time displays to assist the operators.

SPDS - Safety Parameter Display System - SPDS consists of those functions defined by the NRC in NUREG 0737 as necessary for assisting operator actions in case of an emergency.

TRA - Transient Recording and Analysis - TRA is a collection of functional systems which provide real time and historical recording of plant parameters during transient conditions.

ERIS - Emergency Response Information System. ERIS is the title applied to the GE Generic System. ERIS consists of RTAD, TRA and supporting functions.

Data Bases - The ERIS system is designed to utilize generic software applicable to all BWR plants. Data bases are provided so that plant specific sensor inputs, plant system designs and other plant specific characteristics can be input to the ERIS system for use in analyzing the plant parameters displayed.

Constant Data Base - The constant data base is that data base containing the plant specific data used to fine tune the system parameters displayed so that they accurately portray the actual values measured.

Composed Point Data Base - The composed point data base is that data base containing the data required to combine the various algorithm inputs and outputs so that the intended analysis will be performed, thus resulting in the display of the correct parameter.

SPR - Software Problem Report - The SPR form is used to record potential software problems and the ultimate resolution.

FDI - Field Disposition Instruction - The FDI is a formal engineering quality assurance document used to transmit design change instructions to the field.

FDDR -- The Field Deviation Disposition Request - The FDDR is a formal engineering quality assurance document used to transmit deviations from the field for resolution and/or approval.

7. REFERENCES

1. General Electric Licensing Topical Report for GE Emergency Response Information System, NEDE-30284-P.

2. General Electric Generic ERIS (Base RTAD) Software Validation, NEDC-30885, April 1985.

3. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the Final Design Approval of the GESSAR II BWR/6 Nuclear Island Design," NUREG-0979, Supplement No. 4, July 1985.

APPENDIX A

TYPICAL SOFTWARE PROBLEM REPORTS WITH CORRECTIVE ACTIONS

ERIS
SOFTWARE PROBLEM REPORT

PERSON INITIATING THIS SPR: PS SHUNK

ERIS SYSTEM SITE IDENTIFICATION: LIME

DATE: 26-JUL-1985 10:42:27.85

ERIS SPR NUMBER: LIME00381

SITE SPR NUMBER: 336

FUNCTION NUMBER: 22 - Data Transformation Interface

(Assigned by OMNIBUS Configuration Management)

****

PROBLEM STATEMENT:

LOGIC FOR B2111010 IS INCORRECT. SINCE ALL OF THE INPUT SIGNALS AND THE NOT OPERATORS APPLIED TO EAACH SIGNAL, ALL ZEROES ARE FED INTO THE n39 OPERATOR. THIS OPERATOR OUTPUTS A 0 (YES) IF ANY INPUTS ARE IN THE 0 STATE. THEREFORE THE ONLY TIME A 1 (NO) STATE WILL BE OUTPUT IS IF ALL THE ISOLATED SIGNALS ARE IN THE CMD STATE.

***** COMPLETE THE FOLLOWING, ONLY IF THE RESOLUTION *****
***** DOES NOT RESULT IN A CCI *****

RESOLVED BY: F. KROMMENHOCK

DATE: 15-NOV-1985 16:36:34.47

RESOLUTION:

This problem is to be closed with a change to the C95-4020 spec. Since it is not a software problem, this SPR is resolved.

ERIS
SOFTWARE PROBLEM REPORT

PERSON INITIATING THIS SPR: P GLICK

ERIS SYSTEM SITE IDENTIFICATION: LIME

DATE: 26-JUL-1985 11:10:51.63

ERIS SPR NUMBER: LIME00355

SITE SPR NUMBER: 340

FUNCTION NUMBER: 03 - Library Utility Routines

(Assigned by OMNIBUS Configuration Management)

****

PROBLEM STATEMENT:

ERROR MESSAGES FROM THE MESSAGE HANDLER SAYING GRHDIN OR 52 NOT IN DATABASE ARE SOMETIMES DISPLAYED ON THE BOTTOM OF THE TOSHIBA.

***** COMPLETE THE FOLLOWING, ONLY IF THE RESOLUTION *****
***** DOES NOT RESULT IN A CCI *****

RESOLVED BY: GLICK

DATE: 4-OCT-1985 13:32:33.14

RESOLUTION:

Resolved by CCI's E1459 and E1460.

A CCI has been released to the ERIS library for Function Number 03 - Library Utility Routines.

CCI NUMBER: E1459

ERIS
SOFTWARE PROBLEM REPORT

PERSON INITIATING THIS SPR: BILL CURRY

ERIS SYSTEM SITE IDENTIFICATION: LIME

DATE: 7-NOV-1985 20:57:50.56

ERIS SPR NUMBER: LIME00461

SITE SPR NUMBER: 419

FUNCTION NUMBER: 41 - Historical Data Accumulation

(Assigned by OMNIBUS Configuration Management)

****

PROBLEM STATEMENT:

If trended data is kept displaying on a console, and scanning is stopped, the dynamic values turn magenta but the trend lines don't. When scanning is restarted, the dynamic points' colors are restored and the trend lines stay as they were. This is potentially dangerous, as the display gives the impression that the trending data is current; when, in fact, trending will not resume until the display has been re-requested.

Trend lines should be erased or colored magenta when scanning is stopped, or at least when scanning is restarted.

A CCI has been released to the ERIS library for Function Number 41 - Historical Data Accumulation.

CCI NUMBER: E1840

A CCI has been released to the ERIS library for Function Number 29 - Data Accumulation Function.

CCI NUMBER: E1841

SOFTWARE PROBLEM REPORT # 452

SYSTEM: ERIS DATE:13-JAN-1986

SITE: LIMERICK RESOLVED? (NO/SITE/GE):GE

CRITICAL? (CR/HI/ME/LO):

ENGINEER: GILBERT GLICK

FUNCTION: DATA TRANSFORMATION INTERFACE

PROBLEM DESCRIPTIONS (E.G. EXPECTED RESULTS VS ACTUAL RESULTS)

THE POINT R43E0102 (CHK PWR STAT, DRIVEN BY ALGORITHM LRGROUP) WILL COME UP MAGENTA INSTEAD OF RED IF IT FINDS A POINT THAT IS IN ALARM AND HAS BAD DATA BEFORE IT FINDS A GOOD POINT THAT IS IN ALARM.

IMPACT ON CONTINUING WITH OTHER TESTS (IF ANY)

COMMENT:

THE ALGORITHM SHOULD BE EXPANDED TO INCLUDE RECOGNITION OF A DATA BASE ALARM STATUS USED BY THE CUSTOMER FOR VOLTAGE VALUE COLORS.

RESOLUTION

DAN PAPPONE IN SAN JOSE AUTHORIZED A CHANGE TO LRGROUP TO ALLOW THE CHECK FOR A POINT IN ALARM OR PRE-ALARM TO SUCCEED ONLY IF THE POINT HAS GOOD DATA. CHANGE INSTALLED AT SITE BY G. GLICK.

SIGNATURE: G. GLICK DATE: 1/13/86

APPENDIX B

TYPICAL PAGES FROM STARTUP TEST PROCEDURE

DATA SHEET 8.4.1-D
REACTOR PRESSURE - LIMIT TAGS & 2D PLOTS - LOW PRESSURE

PURPOSE:
THIS DATA SHEET IS USED TO DEMONSTRATE THAT THE STATIC AND DYNAMIC FLAGS ASSOCIATED WITH REACTOR PRESSURE REFLECT THE PLANT VALUES AND FUNCTION AS DESIGNED.

TO FULFILL THE DATA REQUIREMENTS FOR THIS DATA SHEET USE THE SAME VIDEO HARDCOPIES AND CONTROL ROOM/PLANT INSTRUMENT DATA COLLECTED FOR SCENARIO 4 - LOW PRESSURE THAT WERE USED FOR DATA SHEET 8.4.1-A.

1. RECORD VALIDATED REACTOR PRESSURE FROM THE RPV PRESSURE VALIDATION DISPLAY, FORMAT # 72.

   ___127_______PSIG

2. RECORD THE REACTOR PRESSURE VALUE FROM THE HEAT CAPACITY TEMPERATURE LIMIT DISPLAY , FORMAT # 41.

   ___126_______PSIG

3. USING THE LIMIT LINES ON THE SUPPRESSION POOL LOAD LIMIT DISPLAY, FORMAT 41 DETERMINE THE "MAXIMUM ALLOWED POOL LEVEL" FOR THE PRESSURE IN STEP 1.

   ___45___FT___0___IN

4. RECORD THE POOL LOAD LIMIT TAG VALUE FROM THE FOLLOWING DISPLAYS. (G43L0011,G43L0012)

FORMAT	DISPLAY NAME	DPL #	DPL TYPE	X-COORDINATES-Y		VALUE FT-IN
031	CNTMT CONT--NR	55,56	V-DPL	629	270	44 - 11
032	CNTMT CONT--UPSET/LR	55,56	V-DPL	629	270	44 - 11
033	CNTMT CONT--UPSET/MR	55,56	V-DPL	629	270	44 - 10
034	CNTMT CONT--UPSET/HR	55,56	V-DPL	629	270	44 - 11
035	CNTMT CONT--FR	55,56	V-DPL	629	270	44 - 11
055	SUPPR POOL WTR LVL	7,8	V-DPL	629	237	44 - 11

5. THE "POOL LD" LIMIT TAG VALUE SHOULD EQUAL STEP 3 +/- 1.5 FT (3% POOL LEVEL FULL SCALE)

"POOL LD" TAG = STEP 3 +/- 1.5 FT
TRUE FALSE (CHECK ONE)

		TRUE	FALSE
031	CNTMT CONT--NR	✓	
032	CNTMT CONT--UPSET/LR	✓	
033	CNTMT CONT--UPSET/MR	✓	
034	CNTMT CONT--UPSET/HR	✓	
035	CNTMT CONT--FR	✓	
055	SUPPR POOL WTR LVL	✓	

DATA SHEET 8.4.1-D (CONTINUED)

6. RECORD THE REACTOR PRESSURE VALUE FROM THE HEAT CAPACITY TEMPERATURE LIMIT DISPLAY , FORMAT # 43.

___127___ PSIG

7. USING THE LIMIT LINES ON THE HEAT CAPACITY TEMPERATURE LIMIT DISPLAY, AND THE RPV PRESSURE (STEP 6) DETERMINE THE MAXIMUM ALLOWED POOL TEMPERATURE.

___203___ DEG F

8. RECORD THE "HEAT CAP" LIMIT TAG VALUE FROM THE POOL TEMP SECTION OF TH FOLLOWING DISPLAYS. (D23L1110=POOL TEMP LIMIT)

FORMAT	DISPLAY NAME	DPL #	DPL TYPE	X-COORDINATES-Y		VALUE DEG F
031	CNTMT CONT--NR	63	V-DPL	629	84	204
032	CNTMT CONT--UPSET/LR	63	V-DPL	629	84	204
033	CNTMT CONT--UPSET/HR	63	V-DPL	629	84	204
034	CNTMT CONT--UPSET/HR	63	V-DPL	629	84	204
035	CNTMT CONT--FR	63	V-DPL	629	84	204
059	SUPPR POOL TEMP	4	V-DPL	636	213	204

9. THE "HEAT CAP" LIMIT TAG VALUE (STEP 8) SHOULD EQUAL STEP 7 +/- 10 DEG F

FORMAT	DISPLAY NAME	"HEAT CAP"(STEP 8)=STEP 7 +/- 10 DEGF TRUE	FALSE (CHECK ONE)
031	CNTMT CONT--NR	✓	
032	CNTMT CONT--UPSET/LR	✓	
033	CNTMT CONT--UPSET/HR	✓	
034	CNTMT CONT--UPSET/HR	✓	
035	CNTMT CONT--FR	✓	
059	SUPPR POOL TEMP	✓	

DATA SHEET 8.4.1-D (CONTINUED)

10. RECORD THE REACTOR PRESSURE VALUE FROM THE RPV SATURATION TEMPERATURE LIMIT DISPLAY, FORMAT # 44.

____127______PSIG

11. USING THE LIMIT LINES ON THE RPV SATURATION TEMPERATURE LIMIT DISPLAY AND THE PRESSURE IN STEP 10, DETERMINE THE "MAXIMUM ALLOWED" REFERENCE LEG TEMPERATURE.

____356_____DEG F

12. RECORD THE "RPV SAT" LIMIT TAG VALUE FROM THE DRYWELL TEMPERATURE SECTION OF THE FOLLOWING DISPLAYS. (D23L0010= SATURATION TEMP LIMIT)

FORMAT	DISPLAY NAME	DPL #	DPL TYPE	X-COORDINATES	-Y	VALUE (PSIG)
031	CNTMT CONT--NR	52	V-DPL	317	84	353
032	CNTMT CONT--UPSET/LR	52	V-DPL	317	84	353
033	CNTMT CONT--UPSET/MR	52	V-DPL	317	84	354
034	CNTMT CONT--UPSET/HR	52	V-DPL	317	84	353
035	CNTMT CONT--FR	52	V-DPL	317	84	353
060	DRYWELL TEMP	1	V-DPL	636	165	353

13. THE "RPV SAT" LIMIT TAG VALUE SHOULD EQUAL STEP 11 +/- 10 DEG F

FORMAT	DISPLAY NAME	"RPV SAT"(STEP 12)=STEP 11 +/- 10 DEGF TRUE	FALSE (CHECK ONE)
031	CNTMT CONT--NR	✓	
032	CNTMT CONT--UPSET/LR	✓	
033	CNTMT CONT--UPSET/MR	✓	
034	CNTMT CONT--UPSET/HR	✓	
035	CNTMT CONT--FR	✓	
060	DRYWELL TEMP	✓	

14. FOR THE FOLLOWING FORMATS RECORD THE PRESSURE COORDINATE OF THE CURRENT CURSOR POSITION FROM THE GRAPH AND THE CHARACTER REPRESENTATION OF PRESSURE.

FORMAT	DISPLAY NAME	COORDINATE VALUE (PSIG)	CHARACTER VALUE (PSIG)
041	SUPPR POOL LOAD LIM	126	126
043	HEAT CAP TEMP LIMIT	127	127
044	RPV SATURATION TEMP	127	127
052	RPV PRESSURE	DWNSCL	127

15. VERIFY THAT THE VALUE FOR THE CURSOR COORDINATES ON THE PLOTS AND THE DISPLAYED "CHARACTER" VALUES ARE THE SAME.

FORMAT	DISPLAY DESCRIPTION	COORDINATE VALUE =WRITTEN RX PRESSURE TRUE/FALSE (CHECK ONE)
041	SUPPR POOL LOAD LIM	✓ /
043	HEAT CAP TEMP LIMIT	✓ /
044	RPV SATURATION TEMP	✓ /
052	RPV PRESSURE	✓ /

16. RECORD THE "SRV LIFT" LIMIT TAG VALUE FROM THE RPV PRESSURE PLOT (FORMAT 052). NOTE THAT THE VALUE FOR THIS TAG DOES NOT CHANGE BUT THE FLAG COLOR CAN CHANGE IF REACTOR PRESSURE > SRV LIFT PRESSURE.

FORMAT	DISPLAY NAME	DPL #	DPL TYPE	X-COORDINATES	-Y	VALUE (PSIG)
000	CRIT PLT VAR	22	S-DPL	283	269	1130 GRN
002	RPV CONT NR/PWR	17	S-DPL	255	223	1130 GRN
003	RPV CONT WR/PWR	17	S-DPL	255	223	1130 GRN
004	RPV CONT FZR/PWR	17	S-DPL	255	223	
005	RPV CONT SDR/PWR	17	S-DPL	255	223	
006	RPV CONT FR/PWR	17	S-DPL	255	223	
007	RPV CONT NR/TEMP	17	S-DPL	255	223	
008	RPV CONT WR/TEMP	17	S-DPL	255	223	
009	RPV CONT FZR/TEMP	17	S-DPL	255	223	
010	RPV CONT SDR/TEMP	17	S-DPL	255	223	
011	RPV CONT FR/TEMP	17	S-DPL	255	223	
052	RPV PRESSURE	16	S-DPL	559	144	1130 GRN

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DATA SHEET 8.4.1-D (CONTINUED)

17. THE "SRV LIFT" LIMIT TAG VALUE SHOULD READ 1130 PSIG

FORMAT	DISPLAY NAME	"SRV LIFT" TAG = 1130 PSIG TRUE	FALSE (CHECK ONE)
000	CRIT PLT VAR	✓	
002	RPV CONT NR/PWR	✓	
003	RPV CONT WR/PWR	✓	
004	RPV CONT FZR/PWR	✓	
005	RPV CONT SDR/PWR	✓	
006	RPV CONT FR/PWR	✓	
007	RPV CONT NR/TEMP	✓	
008	RPV CONT WR/TEMP	✓	
009	RPV CONT FZR/TEMP	✓	
010	RPV CONT SDR/TEMP	✓	
011	RPV CONT FR/TEMP	✓	
052	RPV PRESSURE	✓	

18. IF A "FALSE" CHECK IS FOUND IN STEPS 5,9,13,15 OR 17 THEN WRITE A TEST EXCEPTION ON DATA SHEET 6.0, TEST EXCEPTION LOG. IF THE TEST EXCEPTION WAS RESOLVED MAKE NEW COPIES OF THE AFFECTED FORMATS AND FILL OUT DATA SHEET 8.4.1-D WITH THE NEW DATA. ALSO FILL OUT A SOFTWARE CHANGE FORM AND ATTACH COPIES OF THE CHANGE TO THE RESULTS OF THIS TEST.