

The Light company

HOUSTON LIGHTING & POWER COMPANY

South Texas Project Electric Generating Station P. O. Box 308 Bay City, Texas 77414

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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Safety Parameter Display System (SPDS)
SOUTH TEXAS PROJECT ELECTRIC GENERATING STATION

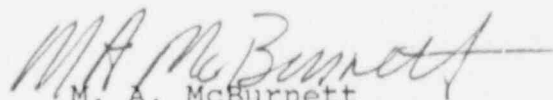
- Reference:
- A. Safety Evaluation Report related to the operation of South Texas Project Units 1 and 2, NUREG-0781 Supplement No. 4, July 1987.
 - B. Responses to Safety Parameter Display System (SPDS) Audit Item; M. R. Wisenburg, HL&P; Letter to the NRC; May 22, 1987; ST-HL-AE-2185.
 - C. Control Room Design Review Status; M. R. Wisenburg, HL&P; Letter to the NRC; November 23, 1987; ST-HL-AE-2421.

In Reference A the NRC Staff identified concerns with the Safety Parameter Display System (SPDS) that HL&P must resolve and report prior to full-power operation. Resolutions are provided in Attachment 1 in response to the concerns identified in SSER 4, pages 18-6 through 18-9 that pertain to the SPDS.

Items identified as license conditions discussed on page 18-9 of SSER 4 are discussed in Attachment 2.

If you should have any questions on this matter, please contact Mr. A. W. Harrison at (512) 972-7298.

Sincerely,


M. A. McBurnett
Manager Support Licensing

MAMcB/THC/ecu

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- Attachment:
1. Safety Parameter Display System (SPDS)
NRC Staff Concerns Relative To SPDS.
 2. Safety Parameter Display System (SPDS)
License Conditions Relative To SPDS.

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South Texas Project
Safety Parameter Display System (SPDS)
NRC Staff Concerns Relative To SPDS

This Attachment addresses the NRC Staff concerns on the Safety Parameter Display System (SPDS) as identified in the South Texas Project SSER 4, Pages 18-6 through 18-9.

South Texas Project
Safety Parameter Display System (SPDS)
NRC Staff Concerns Relative To SPDS

1. Concern:

The SPDS shall continuously display information from which the safety status of the plant can be assessed.

Currently, the SPDS does not meet this requirement of Supplement 1 to NUREG-0737. The SPDS indicates CSF status on safety status boxes. However, no system interlocks or administrative procedures exist to ensure that safety status boxes will be continuously displayed on at least one of the SPDS consoles. At certain levels of the SPDS displays, the status boxes disappear; thus it is possible to select displays that do not show safety function status.

The applicant has committed, in a letter dated May 7, 1987, to issue a standing order before fuel load to correct this condition by dedicating one display unit to the SPDS function. The staff finds this acceptable as an interim solution. However, the applicant must modify the SPDS to permanently correct this condition before startup after the first refueling.

Response:

Administrative instructions were issued to the control room operations staff to ensure that safety status boxes will be continuously displayed on at least one of the SPDS consoles. Modification to the SPDS to permanently display the safety status boxes in one of the SPDS consoles will be implemented prior to the end of the first refueling outage of each STP unit.

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2. Concern:

The rate at which data are updated on the SPDS is variable and is manually controlled. The applicant must establish and implement a formal mechanism for ensuring that the system update rates will be set appropriately and will be protected from any unauthorized adjustment.

Response:

The procedure controlling database changes was revised to control the SPDS system update rates. Password protection has been implemented to limit access to system update rates via terminals located outside the computer room. The Technical Support Control (TSC) computer room, which houses the SPDS, will be maintained locked after July 1, 1988, to limit access to the system terminals inside.

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3. Concern:

Display generation times observed during the audit varied from several seconds to several minutes. Excessively long display generation times (10 seconds or more) should be corrected.

Response:

Display generation times have been improved since the NRC audit. Generation times for SPDS displays are now less than 10 seconds.

The SPDS Man-In-The-Loop validation testing addressed display generation times and concluded that the improved display generation times are acceptable to the user and satisfy the SPDS functional requirements. Refer to Item (5) in this attachment which addresses the results of the Man-In-The-Loop validation testing in more detail.

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4. Concern:

Currently, there are no well established procedures for controlling SPDS software and database changes. Change control procedures should be implemented.

Response:

Change control procedures for software and database changes were revised to address the NRC Staff concerns.

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5. Concern:

In that same letter, the applicant committed to confirm the usability of the SPDS through man-in-the-loop testing.

Response:

The South Texas Project Safety Parameter Display System (SPDS) Man-in-the-Loop Validation was conducted in November 1987 on the STP training simulator utilizing the consulting services of Performance Associates, Inc. Four licensed operating crews participated, one at a time, in the validation. The operating crews were instructed to assess plant conditions and take appropriate actions to mitigate any emergency conditions. Plant procedures, simulator controls and instrumentation, and SPDS displays were to be utilized in the same manner as the operating crew would use them in the plant control room. The SPDS displays provided dynamic, real-time indications of the normal and critical safety function status boxes and safety function data for each scenario in accordance with the information provided by the simulator.

Six plant scenarios were used in the evaluation. The scenarios involved a combination of plant transients, subsequent or simultaneous equipment failures, and instrument failures. Scenarios ranged from simple to complex based on the number and type of transients and failures. All scenarios were based on credible plant events. Observer data was recorded by three observers during each scenario. Debriefing was conducted with each Unit Supervisor and Shift Technical Advisor after each scenario to clarify or amplify observations. Questionnaires were also completed by each member of the operating crew to obtain more detailed user reactions to the SPDS.

Two significant SPDS discrepancies were identified as a result of the Man-in-the-Loop Validation.

- 1) The SPDS does not monitor Core Cooling and Heat Sink Critical Safety Function (CSF) status under adverse containment conditions. This can potentially lead to a less conservative CSF indication. Software logic is being incorporated into the SPDS to automatically implement the correct setpoints on detection of adverse containment conditions.

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- 2) Several of the SPDS CSF setpoints are not consistent with the current revision of the Emergency Operating Procedures (EOP's). These SPDS setpoints are being revised to be consistent with the EOPs.

Both of these discrepancies will be corrected prior to Commercial Operation of STP Unit 1. Interim action has been taken to advise the control room operators of these discrepancies and the correct values. A quick reference document containing this information will be provided in the control room by March 25, 1988.

Pending resolution of these two SPDS discrepancies identified during the Man-in-the-Loop Validation, the SPDS was found to perform in accordance with the design intent described in the STP SPDS Safety Analysis Report.

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6. Concern:

The SPDS display shall be designed to incorporate good human engineering practices.

During the audit, the staff and its consultant observed several deviations from the principles of good human engineering practices. The applicant had already identified and addressed some of these deviations as Human Engineering Deficiencies (HEDs) in the detailed control room design review (DCRDR) process. In a letter dated March 19, 1987, the applicant committed to evaluate and resolve these deviations.

Response:

These deviations have been evaluated and resolved. Each deviation is addressed in an individual basis in this attachment (refer to item numbers 8 through 18).

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7. Concern:

During the site audit, the applicant indicated that an informal review of the SPDS design requirements had been conducted; however, the audit team was not able to confirm that the informal review represented an independent system requirements review.

Response:

HL&P conducted an independent formal review of the SPDS design requirements in NUREG-0737, Supplement 1 versus the STP SPDS design documents and functional purchase specification. The results of this independent review were summarized in Reference B.

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8. Concern:

Color code meanings are inconsistent. For example, on bar charts red indicates the parameter is in alarm, but on time-history plots red identifies the channel that is being trended.

Response:

The Control Room Design Review (CRDR) Project Review Team (PRT) and Management Review Team (MRT) have evaluated this Human Engineering Observation (HEO) as a Category D Human Engineering Deficiency (HED). There is no potential for operator error based on the specific usage on the displays.

When the CRDR Criteria Report is next revised, Appendix S, Guidelines For The Use Of Color In Control Room Design, will be modified to address the use of colors in bar charts and trend plots. Displays may be revised, in accordance with the revised criteria to specify colors used for trend displays based on priority placed by the Operations Department. (Refer to Reference C).

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9. Concern:

On mid-level displays there is no consistently applied method for coding parameters that are in alarm.

Response:

The CRDR PRT and MRT have evaluated this HEO as a Category C HED and concluded that the salmon color in the SPDS mid-level displays should be modified to green/yellow/magenta based on alarm conditions.

The CRDR has recommended implementation of these SPDS modifications prior to or at the second refueling. (Refer to Reference C).

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10. Concern:

Some displays appear to be unnecessarily cluttered. For example, the mid-level normal core cooling display has the average temperature display enclosed in a symbol that appears to contribute nothing to the understanding of the display.

Response:

The displays are not considered cluttered by the Operations Department or the CRDR PRT and no modifications to the SPDS are required. The CRDR PRT and MRT have evaluated this HEO and concluded that no potential for operator error exists. The HEO has been determined not to be an HED.

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11. Concern:

Label formats are not consistent from display to display.

Response:

The SPDS displays will be reviewed in conjunction with a review of all the Control Room computer graphic displays in an effort planned to be completed prior to the end of the first refueling. After the display review, the displays and/or the criteria will be revised as required.

The CRDR PRT and MRT have evaluated this HEO as a Category E (deferred action) HED. (Refer to Reference C).

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12. Concern:

On some cathode-ray tubes (CRTs), it is difficult to distinguish green from yellow. This is especially true when the user is close to the display.

Response:

The CRDR has recommended implementation of modifications to better differentiate the SPDS safety status boxes at the earliest opportunity. These modifications have been scheduled for implementation prior to or during the second refueling. The project also has a preventive maintenance program which will help HL&P to maintain proper adjustment of color on the CRT's to better differentiate between green and yellow colors.

CRDR, PRT and MRT have evaluated this HEO as a Category C HED. (Refer to Reference C).

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13. Concerns:

In some cases, selection of lower level displays by placing the cursor over the point for which more information was desired was possible only by precise positioning of the cursor.

Response:

Placing the cursor over a point for which more information is needed is an operator convenience provided in the Emergency Response Facilities Data Acquisition and Display System and is not a specific function of the SPDS.

The CRDR PRT and MRT have evaluated this HEO and concluded that no potential for operator error exists. This HEO has been determined not to be an HED.

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14. Concern:

The SPDS function keys are poorly differentiated from other keys to call other ERFDADS functions.

Response:

Labeling on the SPDS keys was determined to be adequate by the CRDR PRT and the Operations Department.

The CRDR PRT and MRT have evaluated this HEO as a Category D HED. As such, evaluations will be performed to determine possible means to highlight the SPDS keys based on priority assigned by the Operations Department. (Refer to Reference C).

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15. Concern:

The SPDS function keys are gray with white lettering. The labels are already so dirty that they are hard to read.

Response:

The problem observed by the NRC Staff during the audit was due to construction/startup work. NPOD will maintain the keys clean through plant normal maintenance. As a maintenance issue rather than a design issue, this item is not considered an HED.

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16. Concern:

Parameter alarm limits are not consistently indicated on the mid-level displays. Thus, these displays cannot be used to monitor the margin between the current value and an alarm condition.

Response:

The CRDR has recommended that the salmon color on the mid-level SPDS displays be changed to green/yellow/magenta based on alarm condition. This modification will allow the SPDS user to determine which parameter(s) are in an alarm condition. The CRDR PRT and MRT have evaluated this HEO as a category C HED. These modifications to the SPDS will be implemented prior to or at the second refueling. (Refer to Reference C).

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17. Concern:

The normal CSF status displays include alarm setpoints that may be mode dependent. However, the status determination setpoints do not change with operating mode.

Response:

The setpoints identified by the EOPs are not mode dependent. The SPDS Normal Safety Function (NSF)/Critical Safety Function (CSF) setpoints reflect the EOP setpoints. Therefore, the setpoints within the SPDS are not mode dependent. The SPDS transition between NSF and CSF and vice versa accounts for the transition between normal operation and reactor trip.

The CRDR PRT and MRT have evaluated this HEO and concluded that no potential for operator error exists. This HEO has been determined not to be an HED.

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18. Concern:

The safety status box indicators are rather small. consequently, they may be lost in the clutter on mid-level displays and non-SPDS ERFDADS displays.

Response:

The CRDR team determined that the safety status box indicator size is adequate for the intended viewing distance based on the number of CRTs in the Control Room.

The CDR PRT and MRT have evaluated this HEO and concluded that no potential for operator error exists. The HEO has been determined not to be an HED.

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19. Concern:

The applicant also shall provide a description of the final parameter range and interchannel acceptance criteria to be used in the data validation routines.

Response:

The final parameter ranges used in the STP SPDS are equal to the ranges of post-accident monitoring variables, as listed in STP FSAR Table 7.5-1. This FSAR table provides a listing of R.G. 1.97 variables as defined in FSAR Appendix 7B. The table provides the variable identification, ranges, and the number of channels for post-accident monitoring instrumentation. These variables are transmitted to the Emergency Response Facility Data Acquisition and Display System (ERFDADS) either from the Qualified Display Processing System (QDPS), or directly from field devices for use in the SPDS. Ranges for individual and groups of variables are obtained using the Westinghouse methodology as discussed in FSAR Appendix 7B, which determined the ranges for QDPS variables transmitted to the SPDS.

The interchannel acceptance criteria compares input signals with each other to obtain an average value and an associated quality. When two or more input signals are of the same physical quantity, the Redundant Sensor Algorithm (RSA) compares these signals to each other to obtain an average value and an associated quality. The qualities of the input signals and the data spread compared to normal instrument differences are used to decide whether to include or reject each signal when calculating the average. For two signals, a comparison to a reference signal is made to provide an additional quality check. For three or more signals, a statistical rejection technique is used to qualify the input signals. Three quality levels are used for input sensors and four levels for the calculated output.

For the validation of input and calculated data, data are tagged consistently for input and calculated points using four quality indicators: bad, suspect, poor and good.

Houston Lighting & Power Company

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South Texas Project
Safety Parameter Display System (SPDS)
License Conditions Relative To SPDS

This Attachment addresses the Licensing conditions on the Safety Parameter Display System (SPDS) as identified in the South Texas Project SSER 4, Pages 18-6 through 18-9.

South Texas Project
Safety Parameter Display System (SPDS)
License Conditions Relative to SPDS

Concern:

The SPDS should provide a concise display of critical plant parameters.

The STP SPDS displays are concise and generally acceptable. However, the displays do not include certain critical plant parameters; i.e., the plant vent radiation and the main steam line radiation are not used to determine the status of radioactivity control, a critical safety function required by Supplement 1 to NUREG-0737. Thus, the parameters displayed do not meet the requirements of Supplement 1 to NUREG-0737. In a letter dated March 19, 1987, the applicant justified not providing a radioactivity control CSF. However, the staff has reviewed the justification and finds it unacceptable. The applicant must commit to modify the CSF displays to provide the status of the above radiation parameters before startup after the first refueling.

In addition, the applicant must satisfy the following license conditions before startup after the first refueling:

- (1) Modify the critical safety function displays to provide the status of the radioactivity control safety function and to continuously display the status boxes that summarize plant safety status.
- (2) Establish formal mechanisms for controlling system update rates.
- (3) Investigate and correct excessive display generation times (i.e., those greater than 10 seconds).
- (4) Develop and implement procedures for controlling SPDS software and data base changes.
- (5) Document the process used to verify that the SPDS system requirements are complete and that the process of verification is independent of the design process.

At least 6 months before the first refueling, the applicant should submit a detailed description of actions to be taken to resolve these five license conditions.

South Texas Project
Safety Parameter Display System (SPDS)
License Conditions Relative To SPDS

Response:

- (1) The STP SPDS will be modified to add the radioactivity Control Critical Safety Function (CSF) and to provide continuous display of the CSF status boxes on at least one SPDS CRT in the Control Room. These actions will be completed prior to the end of the first refueling outage for each STP Unit. (Refer also to Attachment 1, Item 1). A detailed description of these modifications will be provided at least 6 months prior to the first refueling outage for STP Unit 1.
- (2) Control of system update rates is addressed in Attachment 1, Item 2.
- (3) Display generation times are addressed in Attachment 1, Item 3.
- (4) Procedures for controlling SPDS software and database changes are addressed in Attachment 1, Item 4.
- (5) The system requirements review is discussed in Attachment 1, Item 7. Results were previously submitted by Reference B.

HL&P considers that license conditions 2 through 5 have been addressed and should be considered closed.