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SUBJECT: Forwards util response to SPDS audit findings & NRC comments provided in 861211,870205 & 0505 ltrs.

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December 24, 1987
161-00722-EEVB/PGN

Docket Nos. STN 50-528/529/530

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Reference: (1) Letter from G. E. Dick, Jr. (NRC) to APS dated December 11, 1986. Subject: Audit of the SPDS.

(2) Letter from E. A. Licitra (NRC) to E. E. Van Brunt, Jr. (ANPP) dated February 5, 1987. Subject: Evaluation of SPDS for Palo Verde Units 1, 2 and 3.

(3) Letter from E. A. Licitra (NRC) to E. E. Van Brunt, Jr. (ANPP) dated May 5, 1987. Subject: Evaluation of SPDS for Palo Verde Units 1, 2 and 3.

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2 and 3
Safety Parameter Display System (SPDS) Audit Open Items
File: 87-A-056-026

Attached please find ANPP's response to the SPDS audit findings and NRC comments provided in References 1, 2, and 3. All open items, with the exception of the revalidation of the SPDS in the simulator, will be completed by December, 1988. The revalidation of the SPDS once it is operational in the simulator will be completed by second quarter, 1989.

If you have any questions or require additional information, please call Mr. A. C. Rogers at (602) 371-4041.

Very truly yours,

E. E. Van Brunt

E. E. Van Brunt, Jr.
Executive Vice President
Project Director

JGH/PGN/dlm
Attachment

cc: O. M. De Michele (all w/a)
A. C. Gehr
G. W. Knighton
E. A. Licitra
J. B. Martin
J. R. Ball

B021
1/1

ATTACHMENT

1. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the parameters selected to be displayed to evaluate critical safety functions. We recommend main steamline radiation be added to the Radiation Release Critical Safety Function or acceptable justification provided for not including this parameter.

ANPP RESPONSE

ANPP will add the value of the steam line radiation, which will reflect the highest of main steam line 1 and main steam line 2, to the Indirect Radiation Release (IRR) Critical Safety Function display. This will be implemented as a bar similar to the other measured values of the IRR screen.

2. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. Based on our audit findings, we recommend that the update rate for deviation bar length and color, and Safety Indicator Block color should be improved.

ANPP RESPONSE

During calendar year 1985, ANPP undertook a Verification and Validation (V&V) effort to review the SPDS from a Human Factors viewpoint. The response time issue was specifically addressed. The licensed operator participants' responses to specific documented questions indicated that the resolution and refresh time of the bar and time history plot data update allows the operator to correctly determine the modeled failures.

Based on the positive response from actual users during the V&V, ANPP believes that the update rate is adequate and appropriate.

2b. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. Based on our audit findings, we recommend the update rate and data resolution for trend displayed data should be based upon process dynamics and operator information needs.

ANPP RESPONSE

During calendar year 1985, ANPP undertook a V&V effort to review the SPDS from a Human Factors viewpoint. The response time issue was specifically addressed. The participants' responses indicated that the resolution and response time of the bar and time history plot data update allows the operator to correctly determine failures.

Based on the positive response of actual users during the V&V, ANPP believes the system update rate is adequate and appropriate.

2c. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. Based on our audit findings, we recommend invalid data should not be used in the determination of safety function status as displayed by the Safety Indicator Blocks.

ANPP RESPONSE

The SPDS Safety Indicator blocks indicate only a high or alarm level data condition of the related parameters. The condition of invalid data does NOT control the color of the Safety Indicator block. Therefore, the system currently operates as recommended, and no modification is required.

2d. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. Based on our audit findings, we recommend a SPDS user who is normally present in the control room should be identified.

ANPP RESPONSE

Based on the NRC approved EOPs, the STA is a member of the operations crew for emergency response, and is the designated individual user of the SPDS during transients. The operators use board instruments and QSPDS for indication of critical plant variables. Although the STA is the designated individual user of SPDS during transients, the SPDS is provided as an aid to operators, and they are not precluded from using it.

2e. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. The licensee should determine if additional and/or periodic retraining on the SPDS is necessary.

ANPP RESPONSE

During analysis and development for INPO accreditation of the PVNGS training program, three tasks were included in the STA qualification card. These tasks are:

1. Operate the ERFDADS terminal.

2. Monitor and evaluate information provided by ERFDADS in the Satellite Technical Support Center (STSC).

3. Monitor and evaluate information provided by ERFDADS from other units in the STSC.

Based on the positive response of actual uses during the V&V, ANPP believes the system update rate is adequate and appropriate.

2c. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. Based on our audit findings, we recommend invalid data should not be used in the determination of safety function status as displayed by the Safety Indicator Blocks.

ANPP RESPONSE

The SPDS Safety Indicator blocks indicate only a high or alarm level data condition of the related parameters. The condition of invalid data does NOT control the color of the Safety Indicator block. Therefore, the system currently operates as recommended, and no modification is required.

2d. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. Based on our audit findings, we recommend a SPDS user who is normally present in the control room should be identified.

ANPP RESPONSE

Based on the NRC approved EOPs, the STA is a member of the operations crew for emergency response, and is the designated individual user of the SPDS during transients. The operators use board instruments and QSPDS for indication of critical plant variables. Although the STA is the designated individual user of SPDS during transients, the SPDS is provided as an aid to operators, and they are not precluded from using it.

2e. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. The licensee should determine if additional and/or periodic retraining on the SPDS is necessary.

ANPP RESPONSE

During analysis and development for INPO accreditation of the PVNGS training program, three tasks were included in the STA qualification card. These tasks are:

1. Operate the ERFDADS terminal.

2. Monitor and evaluate information provided by ERFDADS in the Satellite Technical Support Center (STSC).

3. Monitor and evaluate information provided by ERFDADS from other units in the STSC.

In addition, those STAs who were qualified prior to incorporation of these tasks into the qualification card received this training in STA monthly special training.

These tasks are a normal part of the STA function and therefore do not require continued training.

2f. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. Based on our audit findings, we recommend the minor human engineering concerns identified by the staff's audit should be addressed.

These minor concerns are:

1. The mnemonics identifying the Critical Safety Function (CSF) associated with each Safety Indicator Block are difficult to read.

2. In many cases, color coded text is difficult to read. An example of this on trend plots is the red characters used to indicate the current value of parameters that are in the unsafe range.

3. Time units on trend plots do not line up with the corresponding tick marks on the time axis.

4. The extraneous word "generation" appears on the log-power trend plot.

5. Trend plots are oriented with the newest data at the left edge of the plot and the oldest data at the right. This is reversed from the convention used on analog-hardwired trend recorders.

ANPP RESPONSE

During calendar year 1985, ANPP undertook a V&V effort to review the SPDS from a human factors viewpoint. The color issue was specifically addressed. The participants' responses indicated that the selection of colors used were coordinated to the control room color indications standard and that this selection of colors allowed the operator to correctly determine failures.

ANPP will modify the trend plots to reverse the direction of the plot timing to mimic the analog trend recorders per item 2f.5, align the time axis and corresponding "tic" marks per item 2f.3, and remove the extraneous word "generation" on the log-power trend plot.

2g. NRC RECOMMENDATION

The staff was unable to confirm the adequacy of the human factors program in the design of the displays. Based on our audit findings, we recommend a standard for display formats should be developed and used so that human engineering problems are avoided during future system modifications.

ANPP RESPONSE

A specific description of the display format requirement currently exists in the purchase order specification JM-106, sections 4.2.3.2 through 4.2.3.4. These sections delineate the format, character size limitations, organization, colors, etc. for creation of the specific SPDS displays, and are a guide for all ERFDADS displays to maintain consistency. All future modifications will be made consistent with this specification.

3. NRC RECOMMENDATION

The staff's audit also evaluated design validation. Our review noted some problems with the disposition of Safety Parameter Observations and with the number of modifications to the system. From our analysis of these problems, we recommend Category 2 validation items and Safety Parameter Observations should be entered into the plant change process for tracking.

ANPP RESPONSE

ANPP will enter the remaining outstanding Safety Parameters Observations into the PVNGS plant change process for tracking.

4. NRC RECOMMENDATION

The staff's audit also evaluated design validation. Our review noted some problems with the disposition of Safety Parameter Observations and with the number of modifications to the system. From our analysis of these problems, we recommend once the SPDS is operational in the plant simulator, a re-validation of the system should be conducted. Simulator scenarios should be used that exercise all safety functions and integrate the use of the SPDS with emergency procedures and control board instruments.

ANPP RESPONSE

ANPP will conduct a re-validation of the SPDS displays upon completion of integration of the SPDS model into the simulator. The SPDS model will be incorporated into the simulator as part of the Simulator Upgrade Program.

5. NRC RECOMMENDATION

We recommend the licensee identify and implement interchannel acceptance criteria for data validation. These acceptance criteria should be consistent with the expected deviation between valid inputs under both normal and severe environmental conditions.

ANPP RESPONSE

ANPP will identify and implement interchannel acceptance criteria where practical in accordance with NUREG-0696 and NUREG-0737 guidance.

6. NRC RECOMMENDATION

One other item identified by the staff's contractor should be included in this list of recommendations. This item concerns a capability for the SPDS to be able to ride through the momentary loss of AC power. Although this capacity is currently not a staff requirement, the licensee may find it useful to consider this as a recommendation.

ANPP RESPONSE

The staff's contractor suggests installation of a battery backup for the units' Data Acquisition System (DAS) computer memory to "allow these computers to ride through momentary interruption." The installed DAS computer memory does contain a battery backup that will provide memory power and program integrity for a period exceeding 1 hour. The software is configured for automatic download for data integrity and validation purposes. Engineering judgement at software generation time deemed data integrity and validation highest priority with respect to NUREG-0696 and NUREG-0737 guidance. ANPP does not plan to modify the operation of the SPDS in this area.