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January 23, 1986

Director of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20814

Attention: Ms. Elinor Adensam, Director
Project Directorate 3
Division of BWR Licensing

Dear Ms. Adensam:

SAFETY PARAMETER DISPLAY SYSTEM (SPDS) COMPLETION STATUS
HOPE CREEK GENERATING STATION
DOCKET NO. 50-354

On August 27 and 28, 1985, the NRC performed an audit of the Hope Creek Safety Parameter Display System (SPDS). The results of the audit are documented in a letter from W. Butler (NRC) to R. L. Mittl of Public Service Electric and Gas Company (PSE&G) dated October 15, 1985.

The audit addressed the points of both a Design Verification Audit and a Design Validation Audit as described by Section 18.2 of NUREG 0800 published November 1984. As a result of the audit, the Hope Creek Verification and Validation plan was revised and transmitted for review in a letter from R. L. Mittl (PSE&G) to W. Butler (NRC) dated October 14, 1985. Attachment I to this letter provides for NRC review of the remaining actions PSE&G considers necessary to resolve the SPDS audit issues. Each PSE&G action is correlated to the specific section of the SPDS audit report that presents the audit issue, and a schedule for completion of each resultant action is identified.

Completion of all activities required to resolve the NRC concerns identified in Attachment I will yield the Hope Creek Final SPDS Verification and Validation report. This report will be available for NRC review by November 1986.

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Director of Nuclear
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Also, as stated in our letters of September 10 and December 26, 1985 concerning the status of the Hope Creek Radiation Monitoring System (RMS), PSE&G notes that the RMS inputs to the SPDS will not be available until 180 days after fuel load.

In the event there are any questions with respect to the above, please do not hesitate to contact us.

Sincerely,

A handwritten signature in cursive script, appearing to read "C. D. H. Wagner", followed by a large, stylized flourish or scribble.

Attachment

C D. H. Wagner
USNRC Licensing Project Manager

R. W. Borchardt
USNRC Senior Resident Inspector

ATTACHMENT I

1. Section 3.1.1 Eigen Engineering, Inc. (EEI) is performing the Hope Creek SPDS Verification and Validation (V&V) program. The V&V program will identify system requirements from Section 18.2 of NUREG-0800, NUREG-0737, NUREG-0696 and NSAC/39. EEI shall establish system requirements and incorporate them into a matrix which relates design characteristics to the system requirements. This effort will be completed by March 3, 1986.
2. Section 3.1.2 EEI shall review SPDS system requirements against the existing SPDS design by directly comparing the as-built equipment and system characteristics with system requirements discussed in Item 1. EEI shall clearly and completely explain the methodology for the comparison in the final V&V report. EEI will identify the as-built SPDS characteristics in the final V&V report. This effort will be completed by March 3, 1986.
3. Section 3.1.2 EEI shall compare the Hope Creek simulator to the Control Room and document any discrepancies in the final V&V report. This effort will be completed by May 2, 1986.
4. Section 3.2.1 EEI shall identify the specific documents utilized in performing the Hope Creek SPDS Design Review effort. These documents will be identified in the final V&V report. This effort will be completed by March 3, 1986.
5. Section 3.2.1 EEI shall review documents generated by the human factors review during the system development. The documents shall be audited by the V&V review team in order to ensure that identified deficiencies are properly resolved and appropriate corrective actions implemented in the design of the displays. The results of this review will be included in the V&V final report. This effort will be completed by March 3, 1986.
6. Section 3.2.2 The NRC audit team agrees that design review of the existing computer system which supports the SPDS is unnecessary, however, the features of these systems that are critical to the operation of the SPDS must be documented, coordinated, and controlled

to prevent the installation of future computer system modifications that could impair the operation of the SPDS. PSE&G will provide a definition of the computer systems features which make up SPDS. EEI shall verify that the requirements imposed upon the existing computers by the SPDS are adequately documented and coordinated. The results will be included in the V&V final report. This effort will be completed by March 3, 1986.

7. Section 3.3.1 Validation testing will be coordinated with objectives and methodologies described in other sections of the V&V plan.

Several of the terms used in those sections are abstract and are not defined in the plan. EEI shall clarify these terms and explain methodology for selecting acceptable criteria. This shall be documented in the V&V final report. The V&V report will be available for NRC review by November 1986.

8. Section 3.3.2 PSE&G shall verify the ability of the SPDS to fulfill each requirement outlined in the system requirements matrix was completely tested during the previous developmental and/or installation testing. The NRC audit team recommended that PSE&G use the design characteristics vs requirements matrix to document the existence of these previous tests. Whenever it cannot be determined that previous testing completely demonstrated the SPDS ability to fulfill a system requirement, thorough and rigorous testing of that feature shall be conducted as part of the validation process. PSE&G shall provide EEI with details of in-plant testing. This effort will be completed by May 2, 1986.
9. Section 3.3.2 PSE&G will develop and implement a structured methodology to obtain candid opinions and recommendations about the SPDS from the operators who participate in the dynamic testing. EEI shall interview operators in order to maintain independence. The results will be documented in the V&V final report. This effort will be completed by August 22, 1986.
10. Section 3.3.2 The intent to combine multiple failures in the dynamic validation test scenarios is appropriate. PSE&G shall ensure that the dynamic test scenarios include events that are more severe than the FSAR design basis events. PSE&G committed to these scenarios in the October 14, 1985, letter to W. Butler (NRC) from R.L. Mittl. This commitment is based upon an August 29, 1985 discussion between PSE&G and the NRC Procedures Branch. The results of this testing shall be made available as part of the final SPDS V&V report. This effort will be completed by August 22, 1986.

11. Section 3.4.2 The design characteristics vs system requirements matrix should be used to document the existence of the previous test and to identify untested features that require thorough and rigorous field verification as part of the V&V program.

EEI shall verify that testing has been accomplished and document these test results in the final V&V report. The V&V report will be available for NRC review by November 1986.

12. Section 4.2.2 PSE&G must verify the adequacy of the selected parameter set and provide NRC with documentation of this review. The audit team suggests that this verification include a review of EOP tasks not supported by the SPDS and documentation of the basis for omitting from the SPDS parameter test the variables associated with these tasks. Operations Engineering, Inc. (OEI) will perform this task, the results of which will be provided in the revised Safety Analysis. This effort will be completed by March 3, 1986.

13. Section 4.3.2 With respect to the methodology for validation of displayed SPDS data, NRC stated during the audit that there were some areas which needed improvement. Although it would be desirable to make the improvements prior to fuel load, it was indicated at the audit that the current methodology is considered adequate for first cycle operation. NRC would require, however, that improved methods be implemented prior to startup from the first refueling outage. NRC did not specify any particular algorithm or methodology that could be used to implement the desired improvements. The NRC stated that this would be up to PSE&G. The areas requiring improvements are as follows:

- o The SPDS does not inform the operator when some inputs have been omitted from the calculation of average parameter values.
- o The display that the operator can call up to determine if inputs have been omitted from the average does not account for the fact that with overlapping instrument ranges, some inputs will always be omitted from the average even when functioning normally.
- o The operator does not have ready access to a concise display of the individual input values used to calculate the average parameter values.
- o It appears that the use of process instrumentation averaging modules to develop average suppression pool temperature values does not provide for range checking individual instrument channels.

- o The validation algorithm does not provide for analysis of or notification of the operator about in-range instrument readings that are inconsistent with other inputs.
- o Some of the values used in range checking of parameter inputs are unrealistic.
- o No provisions are made for selecting between "hot calibrated" and "cold calibrated" level instruments as appropriate for plant conditions.

In addition to the data validation problems, the update interval and the resolution of the secondary display trend plots is inadequate.

PSE&G is evaluating the above items with EEI to determine whether modifications are necessary based on system requirements. The need for some items might be determined during specific validation tests. Other items might have to be corrected prior to validation testing. PSE&G training will alert Hope Creek operators to these problem areas.

14. Section 4.3.2 Certain portions of the SPDS hardware are expected to have Mean Time to Failure (MTTR) that are quite short. Although the availability discussed at the audit shows an acceptable SPDS availability, the audit team believes that numerical results are based upon mean time to repair assumption that is inconsistent with maintenance staffing plans.

PSE&G is reviewing the final reliability calculations developed by NUS Corp. The reliability calculations for SPDS hardware will be reviewed to determine if hardware or planned maintenance staffing levels require modifications to assure acceptable system availability. This effort will be completed by June 1, 1986.

15. Section 4.6.1 The report states that the Control Function Parameter Matrix is displayed on every control room CRIDS CRT that is not displaying the primary SPDS display. This statement is incorrect. During the audit, it was agreed that SPDS would be continuously displayed on at least one (1) CRIDS CRT.
16. Section 4.8.2 NRC indicated that procedural controls should be implemented to ensure that consistency is maintained among emergency operating procedures (EOPs), the SPDS, and other plant equipment. Changes to plant

equipment or EOPs should be evaluated for their potential impact on the SPDS, and vice-versa. Hope Creek Operations will revise procedures to ensure PSE&G Engineering Group reviews changes. This effort will be completed by March 3, 1986.

17. Section 5.1 In summary, the NRC concerns regarding the V&V program are:

- o The plan uses certain abstract and non-specific terms to describe some V&V tasks. Before execution, the tasks must be researched, well planned, coordinated, and documented to ensure that their execution will result in an acceptable and auditable V&V effort (see Item 7).
- o The use in the V&V tests and audits of randomly selected channels and equipment is acceptable only if it is ensured that previously documented information exists to justify the use of random selections to demonstrate valid V&V for all SPDS items (see Item 8).
- o The V&V process should be auditably documented to describe and demonstrate that the matrix and the execution of the V&V methodologies will compare requirements with characteristics of equipment and procedures and identify and correct all significant discrepancies (see Items 1 and 2).
- o PSE&G must ensure the methodology used for selecting acceptance criteria will give results that are accurate, comprehensive and complete, and will satisfy the intent of the V&V requirements (see Item 7).

Furthermore, the audit team had a number of recommendations for improving the planned V&V program:

- o The constraints imposed by the SPDS upon the design features of supporting computers should be documented (see Item 6).
- o Performance validation testing scenarios should include events that are outside of the scope of FSAR Chapter 15 events (see Item 10).
- o Performance validation testing should include a structured methodology for obtaining candid feedback about the SPDS from operators who participate in the testing (see Item 9).

18. Section 5.2 In summary, the NRC concerns regarding the SPDS design are:

- o The SPDS does not automatically indicate when some inputs have been eliminated from the calculation of an average parameter value. Furthermore, the operator cannot obtain unambiguous information regarding whether any input is outside of the expected range for the current operating conditions. Ideally, the SPDS should automatically indicate if any input instrument is reading outside of its expected range and the operator should have ready access to a concise display of raw input data for each parameter so that the effect of individual instrument failures may be assessed (see Item 13).
- o Some of the range limits used by the data validation algorithm are unrealistic (see Item 13).
- o The data validation algorithm makes no provisions for removing RPV level instruments that are not calibrated for the current plant conditions from the calculation of RPV average level (see Item 13).
- o The update interval for parameter time-history plots is too long (see Item 13).
- o The parameter magnitude resolution of the time-history plots is insufficient (see Item 13).

Although the HCGS SPDS may be used on an interim basis, ultimate acceptability of the system will depend upon timely and acceptable resolution of these shortcomings (see Item 13).

PSE&G shall implement processes that:

- o Maintain consistency between the Emergency Operating Procedures, operating training and the SPDS (see Item 16).
- o Document SPDS operating experience in order to establish the actual reliability of SPDS hardware and software during operation and to focus the application of resources if improvements in SPDS reliability prove necessary (see Item 14).

Finally, the NRC audit team suggested that PSE&G consider the following NRC audit team concerns with the SPDS design process:

- o It is not clear that the task analysis used to select the SPDS parameter set has been completed. PSE&G shall review the tasks that are not supported by the SPDS parameter set and ensure that a justifiable basis for not including the parameters needed for these steps exists and is documented (see Item 12).
- o The SPDS parameter set selection methodology does not appear to have given sufficient consideration to monitoring safety function status during operating modes other than full power operation. FEI shall verify that the SPDS parameter set is sufficient to monitor safety function status during all applicable modes of operation.
- o The mean-time-to-repair (MTTR) assumptions used in the SPDS availability analysis are not consistent with plant maintenance staffing plans. PSE&G shall review the effect of more realistic MTTR assumptions based upon the availability calculation and determine if additional actions are needed to achieve acceptable availability (see Item 14).