

SAFETY EVALUATION REPORT
FOR THE
EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 AND 2
SAFETY PARAMETER DISPLAY SYSTEM

I. INTRODUCTION

All holders of operating licenses issued by the Nuclear Regulatory Commission (licensees) and applicants for an operating license must provide a Safety Parameter Display System (SPDS) in the control room of their plant. The Commission approved requirements for the SPDS are defined in Supplement 1 to NUREG-0737.

The purpose of the SPDS is to provide a concise display of critical plant variables to control room operators to aid them in rapidly and reliably determining the safety status of the plant. NUREG-0737, Supplement 1, requires licensees and applicants to prepare a written safety analysis describing the basis on which the selected parameters are sufficient to assess the safety status of each identified function for a wide range of events, which include symptoms of severe accidents. Licensees and applicants shall also prepare an Implementation Plan for the SPDS which contains schedules for design, development, installation, and full operation of the SPDS as well as a design Verification and Validation Plan. The Safety Analysis and the Implementation Plan are to be submitted to the NRC for staff review. The results from the staff's review are to be published in a Safety Evaluation Report (SER).

Prompt implementation of the SPDS in operating reactors is a design goal of prime importance. The staff's review of SPDS documentation for operating reactors called for in NUREG-0737, Supplement 1 is designed to avoid delays resulting from the time required for NRC staff review. The NRC staff will not review operating reactor SPDS designs for compliance with the requirements of Supplement 1 of NUREG-0737 prior to implementation unless a pre-implementation review has been specifically requested by licensees. The licensee's Safety Analysis and SPDS Implementation Plan will be reviewed by the NRC staff only to determine if a serious safety question is posed or if the analysis is seriously inadequate. The NRC staff review to accomplish this will be directed at (a) confirming the adequacy of the parameters selected to be displayed to detect critical safety functions, (b) confirming that means are provided to assure that the data displayed are valid, (c) confirming that the licensee has committed to a human factors program to ensure that the displayed information can be readily perceived and comprehended so as not to mislead the operator, and (d) confirming that the SPDS will be suitably isolated from electrical and electronic interference with equipment and sensors that are used in safety systems. If, based on this review, the staff identifies a serious safety question or seriously inadequate analysis, the Director of IE or the Director of NRR may require or direct the licensee to cease implementation.

II. SUMMARY

The staff has reviewed the Georgia Power Company (GPC) documentation regarding the SPDS for Units 1 and 2 of the Edwin I. Hatch Nuclear Plant (References 1 and 2) and concludes that it is acceptable for the licensee to continue implementation of its SPDS Program. The staff's review of the referenced SPDS documentation did not identify any serious safety question or serious inadequacies in the licensee's analysis.

III. EVALUATION

On August 31, 1983, GPC submitted a Safety Analysis for the Plant Hatch SPDS (Reference 1). That initial document was later supplemented with additional information submitted on June 7, 1984 (Reference 2). The staff's review of the two GPC submittals is presented below.

A. SPDS DESCRIPTION

The Hatch SPDS consists of three color CRT displays controlled by keyboard input. The operator can display on any one of the CRTs: "the primary display, trend displays, diagnostic displays, and/or emergency displays." GPC intends to display the primary display on one of the three CRTs at all times. The primary display consists of a display of the twenty parameters listed in the attached Table 1. Display design is based on work done by the Boiling Water Reactor Owners' Group (BWROG).

B. PARAMETER SELECTION

Section 4.1f of Supplement 1 to NUREG-0737 states that:

"The minimum information to be provided shall be sufficient to provide information to plant operators about:

- (i) Reactivity Control
- (ii) Reactor core cooling and heat removal from the primary system
- (iii) Reactor coolant system integrity
- (iv) Radioactivity control
- (v) Containment conditions."

For review purposes, these five items have been designated as Critical Safety Functions.

The selection of the E. I. Hatch SPDS display parameters was made by the licensee using Regulatory Guide 1.97, the plant Technical Specifications, the BWR Generic Emergency Procedure Guidelines (EPGs), and the Station Operating Procedures. The staff has confirmed that the parameters selected are consistent with the presently approved BWR EPGs (Reference 3). The parameters are listed in the attached Table 1.

The staff finds that the parameter selection and supporting analysis for the E. I. Hatch SPDS are acceptable.

C. DISPLAY DATA VALIDATION

The staff reviewed the SPDS documentation to determine that means are provided in the design to assure that the data displayed are valid. In the June 7, 1984 document, the licensee stated:

"The computer system checks validity of any parameter prior to display on the monitors. Data that is probably valid, but cannot be validated (e.g. a redundant signal is not operational) is displayed differently from validated signals. Invalid data is not displayed. The computers perform the following checks to determine validity:

- a. a check to see if the operator has temporarily deleted an input signal;
- b. a check for process conditions which could invalidate the instrument; and
- c. a check of the signals in comparison to available redundant instruments."

Based on this statement, the staff confirms that means are provided in the SPDS design to assure that the data displayed are valid.

D. HUMAN FACTORS PROGRAM

The staff also evaluated the Hatch SPDS documents for a commitment to a Human Factors Program in the development of the SPDS. The licensee stated that human factors have been considered in the design through the use of human engineering guidelines as well as by using the experience of the BWROG, and the results of a dynamic screening program conducted at a BWR simulator. The licensee plans

to conduct a formal human factors review of the SPDS design in conjunction with the Detailed Control Room Design Review (DCRDR). The scope of the human factors review will include design, operator training, and a SPDS simulator evaluation. Human factors criteria will be derived from the following sources:

- i) NUREG 0835, "Human Factors Acceptance Criteria for for the Safety Parameter Display System;"
- ii) NUREG 0700, "Guidelines for Control Room Design;"
- iii) EPRI Report NP-1118, "Human Factors Methods for Nuclear Control Room Design, Vol. IV;" and
- iv) EG&G Technical Report SSDC-5610, "Human Engineering Design Considerations for CRT-Generated Displays."

Results of the SPDS human factors review will be provided with the DCRDR final report scheduled for submittal to the NRC in June 1986.

Based on this information, the staff confirms that the Georgia Power Company did commit to a human factors program in the design of the Plant Hatch SPDS.

E. ELECTRICAL AND ELECTRONIC ISOLATION

Adequate information was not provided by the licensee for the staff to confirm that the SPDS will be suitably isolated from electrical and electronic interference with equipment and sensors that are used in safety systems. Based on the licensee's verbal commitment to providing suitable isolation, the staff concludes that it is acceptable for the licensee to continue implementing its SPDS Program provided that the SPDS is suitably isolated from electrical and electronic interference with equipment and sensors used for safety systems. However, the licensee shall provide the following information to the NRC for confirmatory review:

- a. For each type of device used to accomplish electrical isolation, describe the specific testing performed to demonstrate that the device is acceptable for its application(s). This description should include elementary diagrams when necessary to indicate the test configuration and how the maximum credible faults were applied to the devices.
- b. Data to verify that the maximum credible faults applied during the test were the maximum voltage/current to which the device could be exposed, and define how the maximum voltage/current was determined.

- c. Data to verify that the maximum credible fault was applied to the output of the device in the transverse mode (between signal and return) and other faults were considered (i.e., open and short circuits).
- d. Define the pass/fail acceptance criteria for each type of device.
- e. Provide a commitment that the isolation devices comply with the environmental qualifications (10 CFR 50.49) and with the seismic qualifications which were the basis for plant licensing.
- f. Provide a description of the measures taken to protect the safety systems from electrical interference (i.e., Electrostatic Coupling, EMI, Common Mode and Crosstalk) that may be generated by the SPDS.

IV. CONCLUSIONS

The NRC staff reviewed the SPDS documentation for Hatch 1 and 2 to confirm the adequacy of the parameters selected to be displayed to monitor critical safety functions, to confirm that means are provided to assure that the data displayed are valid, to confirm that the licensee has committed to a Human Factors Program to ensure that the displayed information can be readily perceived and comprehended

so as not to mislead the operator, and to confirm that the SPDS is suitably isolated.

Based on its review, the staff confirms that:

- Parameters selected for display are adequate to detect critical safety functions for a wide range of events;
- Means are provided in the SPDS design to assure that the data displayed are valid.
- An appropriate commitment to a Human Factors Program was made in the design of the SPDS.

The staff could not confirm that:

- The SPDS will be suitably isolated from electrical and electronic interference with equipment and sensors that are used in safety systems.

The staff did not identify any serious safety questions or serious inadequacies in the licensee's analysis. The staff, therefore, concludes that it is acceptable for the licensee to continue implementation of its SPDS program. However, continued implementation

is conditional to providing suitable electrical and electronic isolation with equipment and sensors used for safety systems.

V. REFERENCES

1. Letter to: J. Stolz (NRC) from R. O. Baker (GPC), dated August 31, 1983 (with attachment).
2. Letter to: J. Stolz (NRC) from L. T. Gucwa (GPC), dated June 7, 1984 (with attachment).
3. Safety Evaluation of "Emergency Procedure Guidelines, Revision 2," NEDO-24934, June 1983 (SER dated February 4, 1983).

TABLE 1

E. I. HATCH UNITS 1 AND 2 SPDS PRIMARY DISPLAY PARAMETERS

1. Reactor Water Level
2. Reactor Pressure
3. Torus Water Level
4. Torus Water Temperature
5. Drywell Pressure
6. Drywell Temperature
7. Source Range Log Count Rate (SRM)
8. Main Stack Radiation (Common to Units 1 & 2)
9. Main Steam Safety Relief Valve Open (Pressure in tail pipe)
10. Average Power Range Monitor (APRM)
11. Torus Pressure
12. Drywell/Torus Hydrogen Concentration
13. Drywell/Torus Oxygen Concentration
14. HNP-1 Reactor Building Vent Stack Radiation
15. HNP-2 Reactor Building Vent Stack Radiation
16. Primary Containment Isolation System (PCIS) Automatic Isolation Valve Groups Isolated
17. Secondary Containment Automatic Isolation Valve Groups Isolated
18. Automatic Depressurization System (ADS) Initiated
19. Low-Low Set Logic (LLSL) Initiated
20. Control Rods All In Status