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NED-83-453

Georgia Power
the southern electric system

August 31, 1983

Power Generation Department

Director of Nuclear Reactor Regulation
Attention: Mr. John F. Stoltz, Chief
Operating Reactors Branch No. 4
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

NRC Dockets 50-321, 50-366
Operating Licenses DPR-57, NPF-5
Edwin I. Hatch Nuclear Plant Units 1, 2
Transmittal of Safety Analysis of Safety Parameter
Display System (SPDS)

Gentlemen:

The enclosed safety analysis for the Plant Hatch SPDS was prepared in response to requirements of Generic Letter 82-33, consistent with the schedule provided in our response dated April 15, 1983.

As noted on page 7 of the safety analysis, a review of FSAR Chapter 15 transients and accidents revealed that 4 additional signals per unit are required to complete the SPDS signal list. The 4 signals indicate the position of isolation valves between essential and non-essential portions of the plant service water systems. These signals are not required to assess the basic safety status, but are useful for diagnosis of certain off-normal events.

The signals will be added to the system at the earliest practical opportunity, but may not be implemented prior to the date for SDPS operability provided in our April 15th letter. Plant operators will continue to rely on control room indications for valve status.

Please contact this office if you have any questions or comments.

Very truly yours,

RD Baker

PLS:lb

R. D. Baker
Nuclear Regulatory Engineering
Manager

xc: H. C. Nix, Jr.
Senior Resident Inspector
J. P. O'Reilly, (NRC - Region II)

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SAFETY ANALYSIS OF THE PARAMETER

SELECTION FOR THE SAFETY PARAMETER DISPLAY SYSTEM

PRIMARY DISPLAY

FOR THE

EDWIN I. HATCH NUCLEAR POWER PLANTS

UNITS 1 AND 2

I. INTRODUCTION

The parameters which were selected to be included in the Safety Parameter Display System (SPDS) primary display were compiled using such documents as NUREG 0696, Reg. Guide 1.97, the Plant Technical Specification, the BWR Owners Group SPDS Functional Specification, the BWROG Emergency Procedures, and the Station Operating Procedures. The intent of the parameter selection process was to provide the operator with a set of verified parameters from which he can rapidly assess the safety status of the plant during all normal and abnormal operating conditions and to assist him in assessing whether abnormal conditions warrant corrective action to avoid a degraded core.

The SPDS system is designed such that the minimum number of parameters required to assess the safety status of the plant are displayed on the primary display. These displayed parameters are verified by computer calculation and/or comparison to related instruments. The operator is appraised of an unverified value by a color change and any potentially unsafe condition by a different color change on the display screen.

The SPDS system is designed in such a way that the operator has available to him at all times three CRT displays. By use of the keyboard the operator can display on any one of the three CRTs the primary display, trend displays, diagnostic displays, miscellaneous displays, and/or the emergency displays. The intent is that the primary display will be on one of the three CRTs at all times and the other two CRTs will be used for other displays depending on the plant operating conditions. The operator has available to him by use of the pageable display all inputs which are utilized to provide the verified values to the primary display.

II. PRIMARY DISPLAY

Table 1 is a tabulation of the data which has been provided on the SPDS primary display for Unit 1 and Unit 2. Each of the parameters is discussed below:

Reactor Water Level: The system is capable of monitoring the RPV water level from - 317" up to + 383. Nine level sensors are compared to determine water level. Five of these will not be functional when the recirculation pumps are running.

The SPDS computer will automatically compensate the displayed water level for density variations due to drywell temperature and RPV pressure changes and flag the operator if there is a possibility of flashing in the reference legs. If for any reason the actual water level has dropped below the bottom nozzle on the RPV before the indicated level has reached the Level 1 trip elevation a message "MAY MISS TRIP" will be displayed on the CRT.

The range of level indication available for use by the SPDS computer is from the bottom of the active fuel to the top of the RPV. This range is acceptable for indications during all normal and abnormal modes of operation.

Reactor Pressure: The system is provided with two RPV pressure indications. These instruments have a range of 0 to 1500 psig. The two instruments are compared prior to display to assure that the operator is provided with a verified pressure indication. The value which is displayed is the average value.

The range of indication is wide enough to encompass all normal and abnormal modes of system operation.

Torus Water Level: Four torus level instruments are available in the SPDS system. Two wide range and two narrow range instruments. The wide range instruments read from 0 to 300" and the narrow range instruments read from

133" to 163". The narrow range instruments provide level indication for normal plant and most accident operation and the wide range instrument provides torus level for the total torus.

Torus Temperature: The torus bulk temperature is monitored by 15 temperature elements located around the shell. The temperatures are averaged in order to provide a representative bulk torus temperature. Eleven of the torus temperature instruments have a range of 50 to 250° F and four of the instruments have a range of 0 to 400° F (0-500° F for Unit 1). The range provided encompasses all feasible conditions to which the torus will be subjected.

Drywell Pressure: There are six drywell pressure instruments which continuously monitor the drywell pressure. There are three different ranges of pressure narrow, mid, and wide. The ranges overlap in such a way that the operator has constant pressure indication from -10 psig up to 250 psig. The design pressure of the drywell is 56 psig; therefore, the instrument range far exceeds the pressure to which the drywell will be subjected under any operating conditions.

Drywell Temperature: There are fifteen temperature elements which are strategically located throughout the drywell. These elements are combined on a weighted average basis in order to provide the operator with the drywell bulk temperature indication. The range of all the instruments are 0 to 400° F (0-500° F for Unit 1) which is a range which is wide enough to encompass all normal and accident conditions.

Source Range Count Rate: The source range count rate is provided for the operator to monitor the reactor during shutdown conditions or during startup. There are four instruments with a range of 10^{-1} to 10^{+6} cps. which are provided for this function. These instruments in conjunction with the APRMs will provide the operator with power indication throughout the full range of operating conditions. The operator has in/out indication to assure he is aware of the instrument's location.

Main Stack Radiation: The main stack is shared by both Unit 1 and Unit 2; therefore, both of the SPDSs are provided the same input. The indication is provided to monitor the release of any radioactive material from the main stack.

The system is provided input from two normal range channels with a range of 10^{-1} to 10^{+6} cps and one high range channel with a range of 5.0×10^{-3} to $1.0 \times 10^{+5}$ μci/cc. The high range channel is in standby until the mid-range instrument range is approached and is then utilized. The instrument reading is displayed in μci/cc on the SPDS.

Main Steam Safety Relief Valve Open: Each SRV tail pipe has a pressure switch which provides input to the valve position monitoring system. The back pressure created in the tail pipe provides positive open indication of each valve. These switches in conjunction with the ADS and LLS circuitry provide the operator with information as to whether the SRVs are responding properly to their control systems. If a SRV is open or not open at any time which it should not be, the display will change color bringing this situation to the attention of the operator.

Average Power Range Monitor (APRM): Six APRM detectors are input into the system and display the reactor power level. The system range is from 0% to 125% power. This monitor in conjunction with the SRMs provide the operator with the full range of power indication.

Torus Pressure: The torus pressure is continuously monitored and displayed for use by the operator. The instruments have a range of -10 psig to +90 psig which is great enough to monitor the torus for all normal and accident conditions.

Drywell/Torus Hydrogen Concentration: The drywell/torus atmosphere is monitored during all events when there is an ECCS injection to the reactor and during other operations as required by the plant technical specifications. This is to assure that the hydrogen concentration is within prescribed limits. The SPDS system is provided with redundant

normal and wide range instrument inputs to provide this information. The range of the combined narrow systems and wide range is from 0% to 50%.

Drywell/Torus Oxygen Concentration: The drywell/torus atmosphere is monitored during all events when there is an ECCS injection to the reactor and during other operations as required by the plant technical specifications. This is to assure that the oxygen concentration is within prescribed limits. The SPDS system is provided redundant normal and wide range instrument inputs to provide this information. The range of the combined narrow and wide range systems is from 0% to 30%.

HNP-1 and HNP-2 Reactor Building Vent Stack Radiation: The SPDS on both Unit 1 and Unit 2 is provided with indication of the reactor building vent stack effluent radiation level for both units. There are three sensors for each unit, two normal range with ranges from 10^{+1} to 10^{+6} cpm and one wide range instrument with a range 5.0×10^{-3} to $1 \times 10^{+5}$ μci/cc. The data is displayed on the SPDS in μci/cc.

Primary Containment Isolation System Automatic Isolation Valve Group Isolations: The system is designed to monitor containment isolation signals and provide the operator with information as to the status of each isolation group. If any of the isolation groups have a demand to isolate the operator will be appraised that all required actions took place or that they did not. This information is transmitted by use of color changes in the isolation group indicator boxes.

Secondary Containment Automatic Isolation Valve Groups Isolated: As is the case with the primary isolation groups the SPDS system monitors the demand for secondary containment isolation and provides the operator with information as to whether all actions required for the demand have been met. If the isolation is not complete the operator is appraised by use of a distinctive color which appears in the isolation box.

Automatic Depressurization System (ADS) Initiated: The operator is appraised of a condition which requires ADS to be armed. When initiated the status of the ADS valves is displayed. If all ADS valves do not operate the operator is made aware of the situation by a color change on the display.

Low-Low Set Logic (LLSL) Initiated: The operator is appraised of a condition which requires the LLSL to be armed. The system then monitors the operation of the Low Low Set relief valves and displays the operation of the valve by a change in color. The improper operation of a SRV will be displayed to the operator by a different color.

Control Rods All In Status: The system monitors the control rod positions and will display to the operator that there has been a scram demand and that all rods are properly inserted. If one or more rods do not insert the operator will be notified via a change in color on the SPDS.

III. SAFETY FUNCTIONS

As part of the parameter selection process the safety function categories required by NUREG-0696 were evaluated to assure sufficient information is provided in each required category for the operator to assess the safety status of the plant for all normal and abnormal events. Each of the safety functions listed has been evaluated and the data which is provided to the operator on the primary display is listed in Table 2. The safety functions are as follows:

1. Reactivity control
2. Reactor core cooling and heat removal from primary system
3. Reactor coolant system integrity
4. Radioactivity control
5. Containment integrity

It should be noted that there are numerous other parameters which are available to the operator by use of the other pageable displays which are input to the SPDS and ERF computers and can be called up by use of the keyboard.

IV. CONCLUSION:

The normal and abnormal events which are evaluated in the FSAR have been reviewed and it has been determined that the parameters which are available on the primary display will allow the operator to rapidly assess the safety status of the plant. The operator will be able to assess whether abnormal conditions warrant corrective action to avoid a degraded core. One exception is that the FSAR review revealed that the status of the isolation valves between the essential and non-essential portions of the Plant Service Water System is required to diagnose certain off normal conditions. The required signals will be added to the SPDS/ERF System at a later date. In the interim, the operators will continue to utilize the available control room indications for the valve status.

The final result of the design, installation, and operation of the SPDS system is to display information that permits operators, shift technical advisors, and supervisory personnel to rapidly evaluate the safety status of the plant. To meet this objective a set of parameters has been selected which when correctly interpreted permit an assessment of the status of the five safety functions that are identified in NUREG 0696 which are:

1. Reactivity control
2. Reactor core cooling and heat removal from primary containment
3. Reactor coolant system integrity
4. Radioactivity control
5. Containment integrity

The system has the capabilities to be expanded or modified if after operation there is determined to be a need.

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

TABLE 2

SAFETY FUNCTION PARAMETERS

SAFETY FUNCTION	PARAMETER	RANGE
Reactivity Control	Source range counts	10^{-1} to 10^{+6} counts/sec.
	Average power	0 to 125%
	Rod position	All rods in
	Standby liquid control pump pressure*	0 to 1800 PSIG
	Standby liquid control tank level*	0 to 100% Full
Reactor Core Cooling and Heat Removal from the Primary System	Reactor water level	-317 in to 383 inches
	Reactor pressure	0 to 1500 PSIG
	Torus water level	0 to 300 inches
	Torus water temperature	0 to 250°F
		0 to 400°F (0 to 500° F Unit 1)
	SRV position	Open/closed
	Primary Containment Isolation status	Demand met/Demand not met
	Rod position	All Rods in
	Drywell pressure	-10 to 250 PSIG
	Drywell temperature	0° to 400°F (0 to 500° F Unit 1)
Reactor Coolant System Integrity	Reactor water level	-317 to 383 inches
	Reactor pressure	0 to 1500 PSIG
	Torus level	0 to 300 inches
	Torus pressure	-10 to 90 PSIG
	Torus water temperature	50 to 250°F
		0 to 400°F (0 to 500° F Unit 1)

* The operator must page up this parameter.

TABLE 2(Continued)

SAFETY FUNCTION	PARAMETER	RANGE
Reactor Coolant System Integrity(Continued)	Drywell temperature	0 to 400°F (0 to 500° F Unit 1)
	Drywell pressure	-10 to 250 PSIG
	SRV position	Open/Close
	Primary System Isolation	Demand met/Demand not met
Radioactivity Control	Drywell pressure	-10 to 250 PSIG
	Drywell temperature	0 to 400°F (0 to 500° F Unit 1)
	Torus pressure	-10 to 90 PSIG
	Torus level	0 to 300 inches
	Torus water temperature	50 to 250°F
		0 to 400°F (0 - 500° F Unit 1)
	Drywell/Torus H_2 Concentration	0 to 50%
	Drywell/Torus O_2 Concentration	0 to 30%
	Primary Containment Isolations	Demand met/Demand not met
	Secondary Containment Isolation	Demand met/Demand not met
	Unit 1 Reactor bldg vent Activity	normal range 10^{+1} to 10^{+6} cpm high range 5×10^{-3} to $1.0 \times 10^{+5}$ μci/cc
	Unit 2 Reactor bldg vent Activity	normal range 10^{+1} to 10^{+6} cpm high range 5×10^{-3} to $1.0 \times 10^{+5}$ μci/cc
	Main stack activity	normal range 10^{-1} to 10^{+6} cpm high range 5×10^{-3} to $1.0 \times 10^{+5}$ μci/cc

TABLE 2(Continued)

SAFETY FUNCTION	PARAMETER	RANGE
Containment Integrity	Drywell pressure	-10 to 250 PSIG
	Drywell temperature	0 to 400°F
	Torus water level	0 to 300 inches
	Torus water temperature	50 to 250°F
		0 to 400°F
	Torus pressure	-10 to 90 PSIG
	Drywell/Torus H_2 Concentration	0 to 50%
	Drywell/Torus O_2 Concentration	0 to 30%
	Containment Isolation Status	Demand met/Demand not met