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May 21, 1984
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G9.33.4

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Denton:

River Bend Station - Unit 1
Docket No. 50-458

On April 24, 1984 Gulf States Utilities Company (GSU) submitted the River Bend Station Safety Parameter Display System (SPDS) safety analysis report for your review. Corrected copies are being provided for insertion into the report which correct typographical errors.

Sincerely,

William J. Lee Jr.
for J. E. Booker
Manager - Engineering
Nuclear Fuels & Licensing,
River Bend Nuclear Group

JEB/RJK/je

Attachments

A001
1/10

INTRODUCTION

The accident at Three Mile Island Unit 2 has served to focus Industry attention on the need for adequate instrumentation and human-factored displays for plant operators to follow and help mitigate the consequences of various plant transients. The NRC Staff and the Industry have commissioned several studies (References 1, 2, 4, 5, 7, and 8) to identify the subject instrumentation. River Bend Station (RBS) has reviewed the existing literature on this subject and has within this study documented a listing of needed instrumentation which is specific to the plant. This report establishes a listing of RBS-specific plant variables which is used as a basis upon which to compare the Safety Parameter Display System (SPDS) database and the inventory of main control room instrumentation to be reviewed by the Detailed Control Room Design Review (DCRDR) study.

OBJECTIVE

The objective of this study is to validate an RBS-specific listing of parameters that will be available for monitoring to furnish control room operators with sufficient information to mitigate or limit the consequences of abnormal and accident events. Additionally, the study endeavors to describe the basis upon which RBS believes that the listing is necessary and sufficient to assess the safety status of the plant. The listing delineates specific instruments which are used to monitor each identified parameter.

It is intended that this study will serve as the licensing basis for demonstrating compliance with the guidance provided by the NRC Staff in Generic Letter 82-33 Item 4.2.a.

METHODOLOGY

The validation of an RBS-specific listing of accident monitoring variables required an action plan depicted in Figure 1 and described below to insure a necessary and sufficient list of variables:

1) Several event tree analysis studies (References 1 and 2) were reviewed for information and a tabulation of variables to be monitored was developed.

   Additionally, the RBS emergency operating procedures (EOP's) were reviewed to define specific instrumentation needs for implementing required operator actions defined therein.

2) The two lists generated (Appendix A and B) were merged with the variable list identified in Table 2 of Regulatory Guide 1.97, Revision 3 to form a composite variable list (Table 1) which would encompass the monitoring of a large number of possible events.

TABLE 1 LEGEND

SEQUENCE NO. - Each distinct variable is identified by a unique sequence number for reference purposes.

SOURCE - An "X" is placed in the appropriate column if a variable was identified by the particular method shown.

INSTRUMENT ID - This is the alphanumeric designator assigned by Stone & Webster Engineering Corporation (SWEC) for the sending instrument(s).

CATEGORY - This is the category designation assigned by GSU Engineering from its independent review delineated in Appendix D. The numbering convention definitions are the same as those used in R.G. 1.97, Revision 3.

MCR DISPLAY BENCHBOARD - The SWEC identification number is shown for the panel(s) where the instrument channel display is located.

SPDS SIG ID - This alphanumeric number is the unique identifier assigned by General Electric (GE) to identify the variable monitored by the SPDS database. GE is furnishing the RBS SPDS.

RANGE - The current design range of each listed instrument is given.

REFERENCE NOTES - Table 1 is furnished with a REFERENCE NOTES section at the end of the table for inclusion of technical comments.

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO.	VARIABLE	SOURCE			INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
		RG 1.97	EOP	TREE						
1	Reactor Vessel Water Level	X	X	X	1B21*LTN044C,D *PTN062A,B *LTN081C *LTN027 1C33*LTN017 *LTN004A,B,C	1	1H13*P601 1H13*P680	B21EA001 007 C33EA024 027	209 - 409 in (Fuel Zone) 521 - 581 in (Narrow) 361 - 581 in (Wide Range) 521 - 921 in (Shutdown) 521 - 701 in (Upset)	1
2	Reactor Vessel Pressure	X	X	X	1C33*PTN005 *PTN008A	1	1H13*P680	B21EA008	0-1200 psig 850-1050 psig	
					1B21*PTN062A,B		1H13*P601	013 C33EA028 033	0-1500 psig	
3	Drywell Pressure	X	X	X	1CMS*PT2A,B	1	1H13*P808	CMSPY024 025	0-50 psia	
4	Containment/Drywell Hydrogen Concentration	X	X	X	1CMS*AT25A,B	1	1H13*P808	CMSYY001 002	0 - 10% Hydrogen (Narrow) 0 - 30% Hydrogen (Wide)	2
5	Suppression Pool Level	X	X	X	1CMS*LIT23A,B	1	1H13*P808	CMSLY028 029	minus 18 - 4 ft measured from normal pool level	3

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO.	VARIABLE	SOURCE: RG 1.97	SOURCE: EOP	SOURCE: TREE	INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
6	Suppression Pool Temperature	X	X	X	1CMS*TT24A,C,E *TT24B,D,F *TT24G,J *TT24H,K *TT40A,C *TT40B,D	1	1H13*P808	CMSTY005 ↓ 018	0-200°F	
7	Control Rod Position (Typical for 145 Rods)	X	X	X	1B13-D124 Channel A & B	3	1H13*P680	C11EC004	Full In/Discrete Intermediate Positions/Full Out	4
8	LPCS Flow	X	X	X	1E21*FTN003	2	1H13*P601	E21EA001	0-7000 gpm	
9	Condensate Storage Tank Level	X	X	X	1CNS-LT110	3	1H13*P680	CNMLY006	Top to Bottom	20
10	SLCS Tank Level	X	X	X	1C41*LTN001	2	1H13*P601	C41EA002	0-5000 gal	
11	SRV Position	X	X	X	1SVV*ZE10 A-H, J-N, P-R	2	1H13*P601	B21EC042 ↓ 060	Full Closed/Intermediate/ Full Open	19

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO.	VARIABLE	SOURCE: RG 1.97	SOURCE: EOP	SOURCE: TREE	INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
12	Primary Containment Radiation	X	X	X		1	1H13*P879 *P878			5
	Primary Containment Atmosphere				1RMS*RE16A,B *RE111				$1.0 - 10^{7}$ R/hr $10^{-11} - 10^{-1}$ μCi/cc	
	Drywell Atmosphere				1RMS*RE112				$10^{-11} - 10^{-1}$ μCi/cc	
	Drywell Area				1RMS*RE20A,B				$1.0 - 10^{7}$ R/hr	
	Drywell Personnel Airlock				1RMS-RE138				$1.0 - 10^{5}$ mr/hr	
13	Containment Effluent Radioactivity	X	X	X	1RMS*RE125 *RE5A,B	2			$10^{-7} - 10^{5}$ μCi/cc	6
14	Radiation Level in Circulating Primary Coolant	X								21
15	Drywell Atmosphere Temperature	X	X		1CMS*RTD41A,B,C,D	1	1H13*P808	CMSTY026 027	0 - 446°F	29
16	Containment/Drywell Oxygen Concentration	X	X							7

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO	VARIABLE	SOURCE: RG 1.97	SOURCE: EOP	SOURCE: TREE	INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
17	Drywell Equipment and Floor Drain Sump Water Level	X	X		1E31*LTN093 *LTN094 *LTN095 *LTN096 *LTN097	2	1H13*P632	DFRLY001 005 DERLY003	5 - 25 gpm	
18	Neutron Flux LPRM Detectors	X	X	X	1C51*JEN011 *JEN012 *JEN013 *JEN014	1	1H13*P680	C51EA003 ↓ 010	1 - 120 percent full power	8
	IRM Detectors				1C51*JEN002A *JEN002B *JEN002C *JEN002D *JEN002E *JEN002F *JEN002G *JEN002H			021 ↓ 024	5×10^{-4} - 10.0 percent full power	
	SRM Detectors				1C51*JEN001A,B,C,D				10^{-7} - 10^{-3} percent full power	

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO.	VARIABLE	SOURCE: RG 1.97	SOURCE: EOP	SOURCE: TRIP	INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
19	Main Steam Line Radiation		X		1D17*REN003A,B,C,D	3	1H13*P680		1.0 - 10^6 mr/hr	9
20	Status of HPCS DG			X		3	1H13*F601		Available/Unavailable	10
21	RHR HX Inlet/Outlet Temperatures	X		X	1E12*TEN004A,B *TEN002A,B *TEN027A,B *TEN005A,B *TEN003A,B 1RHS*RTD47A,B	2	1H13*P601	E12EA124 ↓ 129	0^o - 600^oF	
22	Containment Isolation Valve Positions	X		X		1	1H13*P863 *P601 *P870		Open/Intermediate/Closed	11
23	RPV Boron Concentration (grab)	X		X		3				12
24	RHR Flow	X	X		1E12*FTN015A,B,C	2	1H13*P601	E12EA005 ↓ 007	0 - 8,000 gpm	

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO.	VARIABLE	SOURCE: RG 1.97	SOURCE: EOP	SOURCE: TREE	INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
25	MSIV Positions		X	X	1B21*AOVF022A,B,C,D *AOVF028A,B,C,D	1	1H13*P601	B21EC070 074 076 077 079 080 082 083 085 086 088 089 091 092	Open/Closed	13
26	RCIC Flow	X		X	1E51*FTN003	2	1H13*P601	E51EA005 006	0-800 gpm	
27	Feedwater Flow Pump A Pump B	X		X	1C33-FTN002A -FTN002B	3	1H13*P680	C33EA019 020	0 - 8 X 10^6 lbm/hr	

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO.	VARIABLE	SOURCE: RG 1.97	SOURCE: EOP	SOURCE: TREE	INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
28	HPCS Flow	X		X	1E22*FTN005	2	1H13*P601	E22EA001 006	0-7000 gpm	
29	Area Radiation	X	X			3	1RMS-DSPL230			14
30	Airborne Radioactivity Releases	X	X		1RMS*RE125 *RE5A,B -RE6A	2	1RMS-DSPL230		10^{-7} - 10^{5} μCi/cc	15
31	Core Temperature	X		X						16
32	Suppression Pool Hydrogen/ Oxygen Concentration		X			3				27
33	Containment Water Level		X			3				17
34	Containment Atmosphere Temperature		X	X	1CMS*RTD42A-G,J	3	1H13*P808	CMSTY028 037	0^{o} - 200^{0}F	

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO.	VARIABLE	SOURCE: RG 1.97	SOURCE: EOP	SOURCE: TREE	INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
35	Primary Containment Pressure	X	X	X		1				
	Annulus Differential				1HVR*PDT60A thru F			HVRPY222 223		25
	Drywell Differential				1CMS*PDT29A,B		1H13*P808	CMSPY019 020	minus 15 - 30 psid	
	Absolute				1CMS*PT4A,B		1H13*P808		0 - 75 psia	
36	RCIC Turbine Speed		X		1E51*PC002-1	3	1H13*P601	E51EA014	0 - 6000 rpm	
37	Reactor Cooldown Rate		X		1B21-N029A,B -N030A,B -N050A,B	3	1H13*P614	B21EA022	0 - 600°F	26
38	Turbine Stop Valve Positions		X		1C71*ZSN006A-H	3	1H13*P870	N32EA001 002 003 004	Open/Closed	9
39	Turbine Control Valve Positions		X		1MSS-HYVCV1 -HYVCV4	3	1H13*P870	N32EA005 ↓ 008	Open/Closed	9

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO.	VARIABLE	SOURCE: RG 1.97	SOURCE: EOP	SOURCE: TREE	INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
55	SLCS Discharge Pressure	X		X	1C41*PTN004	2	1H13*P601	C41EA003	0-1800 psig	31
56	Condensate Pump Discharge Pressure			X	1CNM-PT105	3	1H13*P680	CNMPY010	0-800 psig	
57	Cumulative Boron Injected		X		1C41*LTN001	3	1H13*P601		0-5000 gal	30
58	HPCS Key Valve Positions			X		3	1H13*P601		Open/Closed	18
59	SSW Key Valve Positions			X		3	1H13*P870		Open/Closed	18
60	RCIC Key Valve Positions			X		3	1H13*P601		Open/Closed	18
61	Liquid Effluent Radioactivity		X			3				
	RHR HX Service Water Cooling Tower Blowdown Liquid Radwaste Effluent				1RMS*RE15A,B -RE108 -RE107		1H13*P879 *P878		10^{-7} to 10^{-2} μCi/cc	
62	SSW Temperature to ESF Components	X			1SWP*TT31A,B	2	1H13*P870	SWPTY017 018	0-125°F	

TABLE 1

COMPOSITE LIST OF ACCIDENT MONITORING VARIABLES

SEQUENCE NO.	VARIABLE	SOURCE: RG 1.97	SOURCE: EOP	SOURCE: TREE	INSTRUMENT ID	CATEGORY	MCR DISPLAY BENCHBOARD	SPDS SIG ID	RANGE	REFERENCE NOTES
65	Liquid Radwaste Tank Levels	X			1LWS-LT13A,B,C -LT8A,B,C,D -LT26A,B -LT521A,B,C,D -LT320 -LT24A,B	3			Top to bottom of tank	25
66	Emergency Ventilation Damper Positions	X				2	1H13*P863	HVRBX001 ↓ 004 009 010 HVWBX001	Open/Closed	23
67	Status of Standby Power	X				2	1H13*P808 *P877			24

TABLE 1 NOTES

Description	Instrument ID
(9) Standby Switchgear 125 VDC Bus Voltage	V-1ENBA03 B03 1E22*VR618

25. The present design of River Bend Station does not provide for direct or indirect readout of the subject variable in the main control room.

26. The instrument readout is a timed, strip chart, multi-pen recorder. Operators ascertain the cooldown rate visually by observing chart slopes. The plant is also provided with a permanent record for later analysis as required.

27. RBS will provide for grab sampling of the suppression pool water inventory. On-site chemistry facilities are equipped to measure the subject variables in a timely fashion commensurate with the needs of MCR operators.

28. The following plant areas are monitored for the subject variable:

    Main Steam Line Pipe Tunnel
    RHR Equipment Areas
    RCIC Equipment Areas
    RWCU Equipment Areas

29. Heatup calculations performed for RBS Unit 1 predict a maximum drywell temperature not to exceed 320° F. Therefore, the existing instrumentation has sufficient range to function as an information source during accident or abnormal conditions.

    The range specified is that of the sending instrument. The actual recording range will be determined at a later time prior to fuel load.

30. RBS EOP's instruct the operator to ascertain this variable by measuring the SLCS tank level drop thus inferring the quantity of sodium pentaborate solution which is injected into the vessel.

31. RBS does not measure SLCS flow directly owing to sensing instrument problems arising from sodium pentaborate contamination of moving parts. Measurement of SLCS pump discharge header pressure is deemed sufficient to ascertain SLCS flow when used in conjunction with other variables such as SLCS tank level.