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William J. Museler
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MAY 09 1994

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

Gentlemen:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2 - REGULATORY GUIDE (RG) 1.97, REVISION 2, POSTACCIDENT MONITORING SYSTEM (PAM) - SUPPLEMENTAL RESPONSE

The purpose of this letter is to provide a supplemental response to TVA's letters dated August 31, 1990 and October 29, 1991, concerning conformance to RG 1.97, Revision 2, for WBN.

The August 31, 1990, letter provided TVA's approach to satisfying the intent of RG 1.97, Revision 2, for WBN and identified the exceptions/deviations and justifications for those exceptions/deviations. TVA's October 29, 1991, letter provided a response to NRC's request for additional information and also added deviations to the August 31, 1990 letter. Since that time, TVA has completed the initial design work of WBN and has determined the need for additional deviations and revisions to TVA's positions concerning compliance with the RG.

Enclosure 1 identifies the revisions for the effective variables and provides the detail and justification for those revisions. Enclosure 2 provides a revised variables table. Enclosure 3 revises Deviation 11 and 13 and adds Deviations 32 through 37. The Final Safety Analysis Report (FSAR) was updated to include these revisions in Amendment 81 except for Deviation 37. This supplement to TVA's position on RG 1.97 may effect the NRC's safety evaluation in Supplemental Safety Evaluation Report (SSER) 9, Section 7.5.2 and Appendix V.

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No commitments are identified in this letter. If you should have any questions, contact J. Vorees at (615)-365-8819.

Very truly yours,

W. J. Museler

William J. Museler

Enclosures
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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN)

REGULATORY GUIDE 1.97, REVISION 2
LIST OF CORRECTIONS

SUMMARY OF QUALIFICATIONS CRITERIA
VARIABLES LIST LEGEND
(FROM AUGUST 31, 1990 SUBMITTAL)

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2
REGULATORY GUIDE (RG) 1.97, REVISION 2
SUPPLEMENTAL RESPONSE

The following changes have been found to be necessary to TVA's letters to NRC dated August 31, 1990 and/or October 29, 1991. Through the remainder of the document, REVISION BARS are used to identify where the changes are incorporated. For each change, the variable, change and justification are provided.

	VARIABLE	CHANGE	JUSTIFICATION
1.	------	Revised Table 1 of Enclosure 1 of the August 31, 1990 submittal "Summary of Qualification Criteria" to clarify recording requirements.	Revised to reflect the TVA response to NRC question in the October 21, 1991 submittal, to move meteorology from a Category 2 to 3 recording variable and to add Effluent and area Radiation Monitors as Category 2.
2.	------	Revise page A1-1 of Enclosure 1, Attachment 1 "Range." The second sentence should be deleted.	Some of the actual ranges are greater than the required ranges.
3.	17, 22b, 39, 40, 42, 45, 49, 50, 53, 58, 59, 60, 63, 71, 76, 77, 92	Revised the table of variables in Enclosure 2 to reflect required ranges. The table headings were revised for Watts Bar range to reflect minimum required range.	Some of the actual ranges are greater than the required ranges, therefore, only the required ranges to meet RG 1.97 requirements will be given in the table.
4.	1	The range is now given (0-700 gpm). Deleted Note 2 from notes.	This system has now developed final ranges which meet RG 1.97 Revision 2 requirements.
5.	4	Added a deviation.	See Deviation 36.
6.	5	A deviation is required since the bottom sensor is not on the bottom of containment.	See Deviation 32.
7.	7	Changed Category from 1 to 2, SE to "No," deleted "See Note 1" from Notes.	This variable is not required to be a Type A, Category 1 variable and is now only a Type C and E variable with Category 2 requirements.
8.	20	Deleted the B3 Category.	See Deviation 35.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2
REGULATORY GUIDE (RG) 1.97, REVISION 2
SUPPLEMENTAL RESPONSE

	VARIABLE	CHANGE	JUSTIFICATION
9.	36	Changed the range to improve the resolution.	Revise to resolve resolution concern - Control Room Design Review (CRDR) - Human Factors Discrepancy.
10.	38	Change the range to improve the resolution.	Change was made as a result of the CRDR.
11.	62	Deleted the Particulate requirement. Added range requirements to the table from Note 6 and deleted "See Note 6 for Range."	This is to be done by sampling.
12.	83	Changed the variable name used from steam generator power operated relief and safety values to Main Steam Flow.	RG 1.97, Revision 2 allows the use of either variable.
13.	93, 94, 95, 96	Revised ranges to agree with requirements for Reporting and Post Accident Monitoring requirements. Revised Variable 94 name. Deleted Note 7.	For Variable 95, see Deviation 33; for Variable 93, deleted Deviation 14. Revised flow requirements for Variable 94 to agree with plant operating conditions. Revised ranges on Variable 96 to agree with PAM requirements.
14.	97C & D	Revised ranges.	See Deviation 34.
15.	70	Revised the deviation to reflect revised range in the October 29, 1991 submittal.	See revised Deviation 11.
16.	91	Revised Deviation 13 to reflect recent design changes.	The high radiation level is no longer used to isolate the Auxiliary Building. Isolation signals resulting from accidents that can cause high radiation in the Auxiliary Building are used to isolate the Auxiliary Building.
17.	98a	Added reference to Deviation 2.	Clarify.

ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) UNITS 1 AND 2
REGULATORY GUIDE (RG) 1.97, REVISION 2
SUPPLEMENTAL RESPONSE

	VARIABLE	CHANGE	JUSTIFICATION
18.	6	Added a deviation	See Deviation #37

TABLE 1
SUMMARY OF QUALIFICATION CRITERIA

CRITERIA	CATEGORY 1	CATEGORY 2	CATEGORY 3
Redundancy	Yes	N/A	N/A
EQ	Per 10CFR50.49 as described in WBN FSAR Chapter 3.	Equipment in harsh environment same as Category 1; N/A for the equipment in mild environment	N/A
Seismic	Must function after seismic event as described in Chapter 3 of WBN FSAR	N/A	N/A
QA	Yes - as given in Chapter 17 of the WBN FSAR for safety-related devices	Yes - for items requiring EQ above. No - for the remainder.	N/A
Power Supply	Class 1E as described in WBN FSAR Chapter 8	Non-1E Instrument power	Non-1E
Physical Separation	Yes - per design basis of the plant	N/A	N/A
Electrical Separation	Yes - non-1E circuit interfaces are through qualified isolation devices	N/A	N/A
Indication	Hardwired Indicator	Indicator, computer or indicating light	Indicator, computer, indicating light, or alarm
Special Labeling on MCR Board	Yes	Yes	No
Testing and Maintenance	Yes	Yes	Yes
Isolation Device Accessibility	Yes	N/A	N/A
Recording	At least 1 channel per analog variable shall be recorded on recorders (as indicated in Table A-1) qualified to Category 2 requirements. Category 1 variables have at least 1 channel trended in the ERFDS.	Effluent and area radiation monitors shall be recorded; Not required for others	Recorder or computer for meteorological; Not required for others

ENCLOSURE 1

ATTACHMENT 1

POSTACCIDENT MONITORING (PAM) INSTRUMENTATION VARIABLES LIST LEGEND

The following table of variables provides a listing of specific design requirements for the post accident monitoring instruments. The table represents the minimum required to conform to Regulatory Guide 1.97, Revision 2. Additional qualification may be provided as a result of other plant, system, or design requirements. The topics described are:

- Variable Name
- Type and Category
- Redundant Channels
- Range, Range Units
- Display Locations
- Sensor Location
- Environmental qualification (EQ)
- Seismic Qualification (SQ)
- Quality Assurance (QA)
- Power Supply

Type and Category - The variable's type(s) and associated category are identified. Entries in this column are derived from the Type selection analyses and RG 1.97. Both the regulatory requirement and the WBN assignment are given.

Redundancy - The number of instrument channels required to monitor the variable. For Category 1 variables, the number of channels is determined from the PAM single failure analysis. Diverse indication used to supplement or replace redundant information is also identified in Note 1.

Range - The required range and engineering units of the instrumention are developed in the Type selection analyses or the required range and accuracy analysis.

Display Location - The locations of the instrument displays are designated as follows:

MCR - Main Control Room Indication
TSC - Variable is stored on computer and displayed on demand
LOC - Local indicator on or near the equipment

Sensor Location - The locations of the instrument sensors are designated as follows:

AB - Auxiliary Building
RB - Reactor Building
YD - Yard
TB - Turbine Building
PSAF - Post Accident Sampling Facility

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT (WBN)

REGULATORY GUIDE 1.97, REVISION 2
REVISED TABLE OF VARIABLES

REGULATORY GUIDE 1.97
POSTACCIDENT MONITORING
TABLE OF VARIABLES

Notes:

1. The following parameters are identified as diverse.

Parameter	Diverse Parameter
T (Hot)	Core Exit Temperature
Core Exit Temperature	T (Hot)
T (Cold)	SG Pressure
Auxiliary Feedwater Flow	SG NR/WR Level

2. Deleted

3. Pressurizer Heater Status required only for safety-related heater banks (backup heater 1A-A and 1B-B).

4. Recorder shall be provided for duration of release from all discharge points.

Noble Gas Activity	1.0E-1 to 1.0E3μCi/cc
Steam Flow Rate	0 to 4945200 lb/hr to PORV and Safety Valves
	0 to 63375 lb/hr to Aux. Feedwater Pump Turbine

5. The vessel level on plasma display is compensated actual vessel level derived from microprocessor algorithm using the upper range, lower range, dynamic range differential pressure, wide range temperature, and wide range pressure.

6. Deleted.

7. Deleted.

8. Transmitters are located in the ERCW pipe tunnel underneath the yard between the Auxiliary Building and the refueling water storage tank.

9. The requirements for Category I variables which require a third independent channel to resolve ambiguity resulting when redundant displays disagree are being implemented at WBN as follows:

   The loop instrumentation for each channel is assigned to a redundant protection set (I, II, III, and IV) and electrical independence is maintained from sensor to display. Physical separation is maintained from the sensor to the isolator in the Auxiliary Instrument Room. From the isolator to the indicator in the Main Control Room, third channel (PAM 3) cables may be routed with either PAM 1 or PAM 2 cables (but not both) depending on its associated protection set.

Enclosure 2

Regulatory Guide 1.97
Postaccident Monitoring Table Of Variables

Var Num	Variable Name	RG 1.97 Type/Category	Watts Bar Type/Category	Redundant Channels	RG 1.97 Range From	RG 1.97 Range To	Minimum Watts Bar Range From	Minimum Watts Bar Range to	Range Units	Display Location	Sensor Location	EQ	SE	QA	Power Supply	Notes
1	Auxiliary Feedwater Flow	D2	A1 D2	P1 P2 2 Channels Per Loop	0	10% Design	0	700	GPM	MCR	AB	YES	YES	YES	1E	(See Note 1)
2	Containment Lower Comp Atm Temperature	D2	A1 D2	P1 P2 2 Channels	40 Deg F	400 Deg F	0	350	Deg F	MCR	RB	YES	YES	YES	1E	Deviation #8
3	Containment Pressure (Narrow Range)	B1 C1	A1 B1 C1 D2	4 Channels	10 Psia	Design Pressure	-2	15	PSIG	MCR	RB	YES	YES	YES	1E	Deviation #24
4	Containment Radiation	C3 E1	A1 C3 E1	P1 P2 2 Upper 2 Lower	1	1.0E7	1	1.0E7	R/hr	MCR	RB	YES	YES	YES	1E	Deviation #36
5	Containment Sump Level (Wide Range)	B1 C1	A1 B1 C1 D2	P1 P2	Bottom Of Contmnt	600k Gal. Equivalent	0	20	Ft	MCR	RB	YES	YES	YES	1E	Deviation #32
6	Core Exit Temperature	B3 C1	A1 B1 C1 D2	P1 P2 8 PAM 1 8 PAM 2	200	2300	200	2300	Deg F	MCR	RB	YES	YES	YES	1E	Minimum Of 16 Operable Thermo Couples. 4 From Each Quadrant (See Note 1) Deviation #30 and # 37
7	Main Steam Line Radiation	C2 E2	C2 E2	1 Channel Per Steam Gen	1.0E-1	1.0E3	1.0E-1	1.0E3	uCi/cc	MCR	RB	YES	NO	YES	NON-1E	
8	Nuclear Inst. (Source Range)		A1 B1 D2	P1 P2	NA	NA	1	1.0E6	CPS	MCR	RB	YES	YES	YES	1E	
9	RCS Pressurizer Level	D1	A1 D1	P1 P2 P3	Bottom	Top	0	100	%	MCR	RB	YES	YES	YES	1E	(See Note 9)
10	RCS Pressure Wide Range	B1 C1	A1 B1 C1 D2	P1 P2 P3	0	3000	0	3000	PSIG	MCR	AB	YES	YES	YES	1E	(See Note 9)
11	RCS Temperature T Cold	B1	A1 B1 C1 D2	4 Channels 1 Per Loop	50	750	50	700	Deg F	MCR	RB	YES	YES	YES	1E	(See Note 1) Deviation #1
12	RCS Temperature T Hot	B1	A1 D2	4 Channels 1 Per Loop	50	750	50	700	Deg F	MCR	RB	YES	YES	YES	1E	(See Note 1) Deviation #1

Enclosure 2

Regulatory Guide 1.97
Postaccident Monitoring Table Of Variables

Var Num	Variable Name	RG 1.97 Type/Category	Watts Bar Type/Category	Redundant Channels	RG 1.97 Range From	RG 1.97 Range To	Minimum Watts Bar Range From	Minimum Watts Bar Range to	Range Units	Display Location	Sensor Location	EQ	SE	QA	Power Supply	Notes
13	Refueling Water Storage Tank Level	D2	A1 D2	P1 P2	Top	Bottom	100	0	%	MCR	YD	YES	YES	YES	1E	
14	Steam Generator Level (Narrow Range)		A1 B1	P1 P2 P3 3 Channels Per SG	NA	NA	0	100	%	MCR	RB	YES	YES	YES	1E	(See Note 1 & 9)
15	Steam Generator Pressure	D2	A1 B1 D2	P1 P2 2 Channels Per SG	Atmos. pressure	20% Of Safety	0	1300	PSIG	MCR	AB	YES	YES	YES	1E	Deviation #3
16	Subcooling Margin Monitor	B2	A1 B2 C1 D2	P1 P2	200*	35*	200*	35*	Deg F	MCR	RB	YES	YES	YES	1E	*200 Deg Subcooling To 35 Deg Superheat
17	Auxiliary Building Passive Sump Level		B1 C1	P1 P2	NA	NA	12.5	72.5	Inches	MCR	AB	YES	NO	YES	NON-1E	
18	Containment Isolation Valve Position Indication	B1	B1 D2	1 Per Valve	Closed	Not Closed	Closed	Not Closed		MCR	RB/AB	YES	YES	YES	1E	Deviation #20
19	Containment Hydrogen Concentration	C1	B1 C1 D2	P1 P2	0	30	0	10	%	MCR	RB	YES	YES	YES	1E	Deviation #2
20	Control Rod Position	B3	D3	1 Channel Per Bank	Full In	Not Full In	0	235	Steps	MCR	RB	NO	NO	NO	NON-1E	Deviation #35
21	Nuclear Inst (Intermediate Range)	B1	B1 D2	P1 P2	1.0E-6%	100% Pwr	1.0E-8%	200%	Power	MCR	RB	YES	YES	YES	1E	
22	REACTOR VESSEL LEVEL	B1	B1 C1 D2	P1 P2 Plasma Display	Bottom Of Core	Top Of Vessel						YES	YES	YES	1E	(See Note 5)
22a	Static Mode (Pumps Not Running)						0	100	%	MCR	RB					0% Represents Reactor Vessel Empty
22b	Dynamic Mode (Pumps Running)						20	100	%	MCR	RB					100% Represents Reactor Vessel Full
23	Containment Pressure (Wide Range)	B1 C1	C1	P1 P2	0	4x Design Pressure	-5	60	PSIG	MCR	RB	YES	YES	YES	1E	
24	Shield Building Vent (Noble Gas Activity)	C2 E2	C2 E2	1 Channel	1.0E-6	1.0E4	1.0E-6	1.0E4	uCi/cc	MCR	AB	YES	NO	YES	NON-1E	

Enclosure 2

Regulatory Guide 1.97
Postaccident Monitoring Table Of Variables

Var Num	Variable Name	RG 1.97 Type/Category	Watts Bar Type/Category	Redundant Channels	RG 1.97 Range From	RG 1.97 Range To	Minimum Watts Bar Range From	Minimum Watts Bar Range to	Range Units	Display Location	Sensor Location	EQ	SE	QA	Power Supply	Notes
25	ABGTS High Pressure Alarm		D2	1 Channel Per Fan	NA	NA	NA	-0.2	In. H2O	MCR	AB	YES	NO	YES	NON-1E	
26	ACAS Pressure	D2	D2	1 Channel Per Train	Plant	Specific	0	150	PSIG	MCR	AB	YES	NO	YES	NON-1E	
27	AFW Valve Status		D1	1 Channel Per Valve	NA	NA	Open	Closed	NA	MCR	AB	YES	YES	YES	1E	
28	Accumulator Flow Isolation Valve Status	D2	D3	1 Channel Per Valve	Open	Closed	Open	Closed	NA	MCR	AB	NO	NO	NO	NON-1E	Deviation #16
29	Accumulator Tank Level	D2	D3	1 Channel Per Tank	10%	90%	7632	8264	GAL	MCR	RB	NO	NO	NO	NON-1E	Deviation #15
30	Accumulator Tank Pressure	D2	D3	1 Channel Per Tank	0 psig	750 psig	0	700	PSIG	MCR	RB	NO	NO	NO	NON-1E	Deviation #6
31	Annulus Pressure		D2	1 Channel	NA	NA	-10	0	In. H2O	MCR	RB	YES	NO	YES	NON-1E	
32	Aux. Feed Pump Turbine Steam Supply Isolation Valve Status		D3	1 Channel Per Valve	NA	NA	Open	Closed	NA	MCR	AB	NO	NO	NO	NON-1E	
33	Battery Current (125V dc Vital)	D2	D2	1 Channel Per Battery	Plant	Specific	-200	+600	AMPS	MCR	AB	YES	NO	YES	N/A	
34	Bus Voltage (125V dc Vital)	D2	D2	1 Channel Per Battery	Plant	Specific	75	150	VOLTS	MCR	AB	YES	NO	YES	N/A	
35	Bus Voltage (480V Shutdown)	D2	D2	1 Channel Per Train	Plant	Specific	0	600	VOLTS	MCR	AB	YES	NO	YES	N/A	
36	Bus Voltage (6.9kv Shutdown)	D2	D2	1 Channel Per Train	Plant	Specific	6400	7400	VOLTS	MCR	AB	YES	NO	YES	N/A	Analog Scales and Digital Display
37	CCS Surge Tank Level Abnormal		D3	1 Channel Per Train	NA	NA	0	100	%	MCR	AB	NO	NO	NO	NON-1E	
38	Centrifugal Charging Pump Total Flow	D2	D2	1 Channel	0	110% Design	0	1000	GPM	MCR	AB	YES	NO	YES	NON-1E	

Enclosure 2

Regulatory Guide 1.97
Postaccident Monitoring Table Of Variables

Var Num	Variable Name	RG 1.97 Type/Category	Watts Bar Type/Category	Redundant Channels	RG 1.97 Range From	RG 1.97 Range To	Minimum Watts Bar Range From	Minimum Watts Bar Range to	Range Units	Display Location	Sensor Location	EQ	SE	QA	Power Supply	Notes
39	Charging Header Flow	D2	D3	1 Channel	0	110% Design	0	110	GPM	MCR	AB	NO	NO	NO	NON-1E	Deviation #17
40	Component Cooling Water To ESF Flow	D2	D2	1 Channel Per HX	0	110% Design	0	5561	GPM	MCR	AB	YES	NO	YES	NON-1E	
41	Component Cooling Water Supply Temperature	D2	D2	1 Channel Per Train	32 Deg F	200 Deg F	50	150	Deg F	MCR	AB	YES	NO	YES	NON-1E	Deviation #7
42	Condensate Storage Tank Water Level	D1	D3	1 Channel Per Tank	Plant	Specific	0	385,000	GAL	MCR	AB	NO	NO	NO	NON-1E	Not Primary Source of Aux. Feed Water. See Varible 27
43	Containment Air Return Fan Status	D2	D2	1 Channel Per Fan	Plant	Specific	On	Off	NA	MCR	RB	YES	NO	YES	NON-1E	(Breaker Status)
44	Containment Cooling Valve Status		D3	1 Channel Per Valve	NA	NA	Open	Closed	NA	MCR	AB	NO	NO	NO	NON-1E	
45	Containment Spray Flow	D2	D2	1 Channel Per Train	0	110% Design	0	4400	GPM	MCR	AB	YES	NO	YES	NON-1E	
46	Containment Spray HX Outlet Temperature		D2	1 Channel Per HX	NA	NA	0	200	Deg F	MCR	AB	YES	NO	YES	NON-1E	
47	Containment Sump Water Level (Narrow Range)	B2 C2	D3	1 Channel	Botton Of Sump	Top Of Sump	2	66	Inches	MCR	RB	NO	NO	NO	NON-1E	Deviation #12
48	Containment Sump Water Temperature	D2	D2	1 Channel	50 Deg F	250 Deg F	50	400	Deg F	MCR	AB	YES	NO	YES	NON-1E	Used RHR Inlet Temperature Loop which is qualified
49	Diesel Generator Power	D2	D2	1 Channel Per DG	Plant	Specific	0	4.8	MWATTS	MCR	AB	YES	NO	YES	N/A	
50	Diesel Generator Volts	D2	D2	1 Channel Per DG	Plant	Specific	0	6900	VOLTS	MCR	AB	YES	NO	YES	N/A	
51	ECCS Valve Status		D2	1 Channel Per Valve	NA	NA	Open	Closed	NA	MCR	AB	YES	NO	YES	NON-1E	
52	ERCW Header Flow		D2	1 Channel Per Header	NA	NA	0	20,000	GPM	MCR	*	YES	NO	YES	NON-1E	* See Note 8

Enclosure 2

Regulatory Guide 1.97
Postaccident Monitoring Table Of Variables

Var Num	Variable Name	RG 1.97 Type/Category	Watts Bar Type/Category	Redundant Channels	RG 1.97 Range From	RG 1.97 Range To	Minimum Watts Bar Range From	Minimum Watts Bar Range to	Range Units	Display Location	Sensor Location	EQ	SE	QA	Power Supply	Notes
53	ERCW Supply Temperature		D2	1 Channel Per Header	NA	NA	32	200	Deg F	MCR	AB	YES	NO	YES	NON-1E	
54	Emergency Gas Treatment Damper Position	D2	D2	1 Channel Per Damper	Open	Closed	Open	Closed	NA	MCR	AB	YES	NO	YES	NON-1E	
55	Emergency Ventilation Damper Status	D2	D2	1 Channel Per Damper	Open	Closed	Open	Closed	NA	MCR	AB	YES	NO	YES	NON-1E	
56	Hydrogen Recombiner Status		D3	1 Channel Per Recombiner	NA	NA	On	Off	NA	MCR	RB	NO	NO	NO	NON-1E	
57	Igniter Group Status		D3	1 Channel Per Group	NA	NA	On	Off	NA	MCR	RB	NO	NO	NO	NON-1E	
58	Inverter Current (120V ac Vital)	D2	D2	1 Channel Per Inverter	Plant	Specific	0	167	AMPS	AB	AB	YES	NO	YES	N/A	Local Indication
59	Inverter Voltage (120V ac Vital)	D2	D2	1 Channel	Plant	Specific	115	125	VOLTS	AB	AB	YES	NO	YES	N/A	Local Indication
60	Letdown Flow	D2	D3	1 Channel	0	110% Design	0	144	GPM	MCR	AB	NO	NO	NO	NON-1E	Deviation #18
61	MCR Pressure		D3	1 Channel	NA	NA	0	0.50	In. H2O	MCR	CB	NO	NO	NO	NON-1E	
62	MCR Radiation Level		D2	1 Channel	1.0E-1	1.0E4	1.0E-1	1.0E4	mR/hr	MCR	MCR	YES	NO	NO	NON-1E	
63	Main Feedwater Flow	D3	D3	1 Channel Per Loop	0	110% Design	0	4,372,700	lb/hr	MCR	AB	NO	NO	NO	NON-1E	
64	Normal Emergency Boration Flow	D2	D2	1 Channel	0	110% Design	0	150	GPM	MCR	AB	NO	NO	YES	NON-1E	Deviation #4
65	THIS LINE INTENTIONALLY LEFT BLANK															
66	Pressurizer Heater Status (Electric Current)	D2	D2	1 Channel Per Group	Plant	Specific	0	50.5	AMPS	MCR	AB	YES	NO	YES	NON-1E	(See Note 3)

Enclosure 2

Regulatory Guide 1.97
Postaccident Monitoring Table Of Variables

Var Num	Variable Name	RG 1.97 Type/Category	Watts Bar Type/Category	Redundant Channels	RG 1.97 Range From	RG 1.97 Range To	Minimum Watts Bar Range From	Minimum Watts Bar Range to	Range Units	Display Location	Sensor Location	EQ	SE	QA	Power Supply	Notes
67	Pressurizer Pressure Relief Valve Pos. (PORV, Block & Code)	D2	D2	1 Channel Per Valve	Closed	Not Closed	Closed	Not Closed		MCR	RB	YES	NO	YES	NON-1E	
68	Pressurizer Relief Tank Level	D3	D3	1 Channel	Top	Bottom	0	100	%	MCR	RB	NO	NO	NO	NON-1E	
69	Pressurizer Relief Tank Pressure	D3	D3	1 Channel	0	Design Pressure	0	100	PSIG	MCR	RB	NO	NO	NO	NON-1E	
70	Pressurizer Relief Tank Temperature	D3	D3	1 Channel	50 Deg F	750 Deg F	50	400	Deg F	MCR	RB	NO	NO	NO	NON-1E	Deviation #11
71	RCP Seal Injection Flow		D3	1 Ch Per RCP	NA	NA	0	13.2	GPM	MCR	AB	NO	NO	NO	NON-1E	
72	RCS Head Vent Valve Status		D2	1 Channel Per Valve	NA	NA	Closed	Not Closed	NA	MCR	RB	YES	NO	YES	NON-1E	
73	RHR Heat Exchanger Outlet Temperature	D2	D2	1 Channel Per HX	32 Deg F	350 Deg F	50	400	Deg F	MCR	AB	YES	NO	YES	NON-1E	Deviation #9
74	RHR Pump Flow (RHR System Flow)	D2	D2	1 Channel Per Pump	0	110% Design	0	5500	GPM	MCR	AB	YES	NO	YES	NON-1E	
75	RHR Valve Status		D3	1 Channel Per Valve	NA	NA	Open	Closed	NA	MCR	AB	NO	NO	NO	NON-1E	
76	Reactor Coolant Pump Status (Motor Current)	D3	D3	1 Channel Per Pump	Plant	Specific	0	712	AMPS	MCR	AB	NO	NO	NO	NON-1E	
77	Safety Injection Pump Flow	D2	D2	1 Channel Per Pump	0	110% Design	0	715	GPM	MCR	AB	YES	NO	YES	NON-1E	
78	Safety Injection System Valve Status		D3	1 Channel Per Valve	NA	NA	Open	Closed	NA	MCR	AB	NO	NO	NO	NON-1E	
79	Spent Fuel Pool Level Alarm		D2	1 Channel	NA	NA	748ft 11-1/2in	749ft 2-1/2in	ft,in	MCR	AB	YES	NO	YES	NON-1E	Range Reflects Low and High Alarm Setpoints
80	Spent Fuel Pool Temperature Alarm		D2	1 Channel	NA	NA		127	Deg F	MCR	AB	YES	NO	YES	NON-1E	Upper Range Is Alarm Set point

Enclosure 2

Regulatory Guide 1.97
Postaccident Monitoring Table Of Variables

Var Num	Variable Name	RG 1.97 Type/Category	Watts Bar Type/Category	Redundant Channels	RG 1.97 Range From	RG 1.97 Range To	Minimum Watts Bar Range From	Minimum Watts Bar Range to	Range Units	Display Location	Sensor Location	EQ	SE	QA	Power Supply	Notes
81	Steam Generator Blowdown Isolation Valve Status		D2	1 Channel Per Valve	NA	NA	Closed	Not Closed	NA	MCR	RB	YES	NO	YES	NON-1E	
82	Steam Generator Level (Wide Range)	D1	D1	4 Channels 1 Per SG	Tube Sheet	Separators	0	100	%	MCR	RB	YES	YES	YES	1E	Deviation #10
83	Main Steam Flow	D2	D2	1 Channel Per S/G	NA	NA	0	4,500,000	lbs/hr	MCR	AB	YES	NO	YES	NON-1E	
84	Tritiated Drain Collector Tank Level	D3	D3	1 Channel Per Train	Top	Bottom	4	96	%	MCR	AB	NO	NO	NO	NON-1E	Local Indication Deviation #25
85	Volume Control Tank Level	D2	D3	1 Channel	Top	Bottom	0	100	%	MCR	AB	NO	NO	NO	NON-1E	Deviation #19
86	Waste Gas Decay Tank Pressure	D3	D3	1 Channel Per Tank	0	150% Design	0	150	PSIG	MCR	AB	NO	NO	NO	NON-1E	Local Indication Deviation #23
87	Radiation Exposure Meters	E3		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Deviation #22
88	Airborne Radiohalogens And Particulates	E3	E3	Portable	1.0E-9	1.0E-3	1.0E-9	1.0E-3	uCi/cc	ANALYSIS	SAMPLE	NO	NO	NO	NA	Airborne I-131 and particulates
89	Plant And Environs Radiation	E3	E3	Portable	1.0E-3	1.0E4	1.0E-3	1.0E4	RAD/hr	PORTABLE	PORTABLE	NO	NO	NO	NA	
90	Plant and Environs Radioactivity (portable instr.)	E3	E3	PORTABLE	NA	NA	NA	NA	NA	ANALYSIS	SAMPLE	NO	NO	NO	NA	Multi Channel Gamma Ray Spectrometer
91	Auxiliary Building Vent (Noble Gas)	E2	E2	1 Channel	1.0E-6	1.0E3	1.0E-6	1.0E-2	uCi/cc	MCR	AB	YES	NO	YES	NON-1E	Deviation #13
92	Auxiliary Building Vent (Flow Rate)	E2	E2	1 Channel	0	110% Design	0	250,800	CFM	MCR	AB	YES	NO	YES	NON-1E	
93	Auxiliary Building Vent (Part & Halogens)	E3	E3	1 Channel	1.0E-3	1.0E2	1.0E-3	1.0E-2	uCi/cc	ANALYSIS	SAMPLE	NO	NO	NO	NON-1E	Sampling With Onsite Analysis Capability
94	Condenser Vacuum Exhaust Vent (Flow Rate)	E2	E2	1 Channel	0	110% Design	0	45	SCFM	MCR	TB	YES	NO	YES	NON-1E	

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Regulatory Guide 1.97
Postaccident Monitoring Table Of Variables

Var Num	Variable Name	RG 1.97 Type/Category		Watts Bar Type/Category		Redundant Channels	RG 1.97 Range From	RG 1.97 Range To	Minimum Watts Bar Range From	Minimum Watts Bar Range to	Range Units	Display Location	Sensor Location	EQ	SE	QA	Power Supply	Notes
95	Condenser Vacuum Pump Exhaust Vent (Noble Gas)	C3	E2	C3	E2	1 Channel	1.0E-6	1.0E5	3.2E-7	3.5E3	uCi/cc	MCR	TB	YES	NO	YES	NON-1E	Deviation #33
96	ERCW Radiation Monitors				E2	1 Channel Per Discharge Point	NA	NA	1.93E-4	1.93E-2	uCi/cc	MCR	AB	YES	NO	YES	NON-1E	
97	POST ACCIDENT SAMPLE SYSTEM		E3		E3	1 System						GRAB	PASF	NO	NO	NO	NON-1E	
97a	Reactor Coolant Chloride Concentration		E3		E3		0	20	1	20	ppm	NA	SAMPLE					Deviation #29
97b	Reactor Coolant Dissolved Hydrogen		E3		E3		0	2000	10	2000	cc/kg (STP)	NA	SAMPLE					Deviation #21
97c	Reactor Coolant Disolved Oxygen		E3		E3		0	20	1	20	ppm	NA	SAMPLE					Deviation #34
97d	Reactor Coolant Total Dissolved Gas		E3		E3		0	2000	100	2000	cc/kg (STP)	NA	SAMPLE					Deviation #34
97e	Reactor Coolant Boron	B3	E3		E3		0	6000	50	6000	ppm	NA	SAMPLE					Deviation #26
97f	Reactor Coolant PH		E3		E3		1	13	1	13	pH	NA	SAMPLE					
97g	Reactor Coolant Sample Activity	C1	E3	C3	E3		10uCi/ml	10Ci/ml	10uCi/ml	10Ci/ml	Ci/ml	NA	SAMPLE					Deviation #5
97h	Reactor Coolant Gamma Spectrum		E3		E3		NA	NA	NA	NA	NA	ANALYSIS	SAMPLE	NA	NA	NA	NA	Isotopic Analysis
98	CONTAINMENT AIR																	
98a	Containment Air H2		E3		E3		0%	30%	0%	10%	By Vol	ANALYSIS	SAMPLE	NA	NA	NA	NA	Also Measured by Hydrogen Analyzer Deviation #2

Enclosure 2

Regulatory Guide 1.97
Postaccident Monitoring Table Of Variables

Var Num	Variable Name	RG 1.97 Type/Category	Watts Bar Type/Category	Redundant Channels	RG 1.97 Range From	RG 1.97 Range To	Minimum Watts Bar Range From	Minimum Watts Bar Range to	Range Units	Display Location	Sensor Location	EQ	SE	QA	Power Supply	Notes
98b	Oxygen Content	E3		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Deviation #27
98c	Gamma Spectrum Sample	E3	E3	NA	NA	NA	NA	NA	NA	ANALYSIS	SAMPLE	NA	NA	NA	NA	Isotopic Analysis
99	Shield Building Vent Flow	E2	E2	1 Channel Per Unit	0	110% Design	0	30,800	CFM	MCR	AB	YES	NO	YES	NON-1E	
100	Shield Building Vent Monitor (Particulate And Iodine)	E3	E3	1 Channel Per Unit	1.0E-3	1.0E2	1.0E-3	1.0E2	uCi/cc	NA	SAMPLE	NO	NO	NO	NON-1E	Sampling With Onsite Analysis Capability
101	Steam Generator Discharge Vent (Flow Rate and Noble Gas)	E2	E2	1 Channel Per Release Point	1.0E-1	1.0E3	NOTE 4	NOTE 4		MCR	AB	YES	NO	YES	NON-1E	
102	METEOROLOGY															
102a	Vertical Temperature Difference	E3	E3	1 Channel	-9	+18	-9	+18	Deg F	MCR	YD	NO	NO	NO	NON-1E	
102b	Wind Direction	E3	E3	1 Channel	0	360	0	360	Deg	MCR	YD	NO	NO	NO	NON-1E	
102c	Wind Speed	E3	E3	1 Channel	0	67	0	50	MPH	MCR	YD	NO	NO	NO	NON-1E	Deviation #28
103	Radiation Exposure Rate	E2	E3	N/A	1.0E-1	1.0E4	1.0E-3	1.0E4	R/hr	NA	NA	NO	NO	NO	NA	Deviation #31

REGULATORY GUIDE 1.97
POSTACCIDENT MONITORING
TABLE OF VARIABLES

Notes:

1. The following parameters are identified as diverse.

Parameter	Diverse Parameter
T (Hot)	Core Exit Temperature
Core Exit Temperature	T (Hot)
T (Cold)	SG Pressure
Auxiliary Feedwater Flow	SG NR/WR Level

2. Deleted

3. Pressurizer Heater Status required only for safety-related heater banks (backup heater 1A-A and 1B-B).

4. Recorder shall be provided for duration of release from all discharge points.

Noble Gas Activity	1.0E-1 to 1.0E3μCi/cc
Steam Flow Rate	0 to 4945200 lb/hr to PORV and Safety Valves
	0 to 63375 lb/hr to Aux. Feedwater Pump Turbine

5. The vessel level on plasma display is compensated actual vessel level derived from microprocessor algorithm using the upper range, lower range, dynamic range differential pressure, wide range temperature, and wide range pressure.

6. Deleted.

7. Deleted.

8. Transmitters are located in the ERCW pipe tunnel underneath the yard between the Auxiliary Building and the refueling water storage tank.

9. The requirements for Category I variables which require a third independent channel to resolve ambiguity resulting when redundant displays disagree are being implemented at WBN as follows:

   The loop instrumentation for each channel is assigned to a redundant protection set (I, II, III, and IV) and electrical independence is maintained from sensor to display. Physical separation is maintained from the sensor to the isolator in the Auxiliary Instrument Room. From the isolator to the indicator in the Main Control Room, third channel (PAM 3) cables may be routed with either PAM 1 or PAM 2 cables (but not both) depending on its associated protection set.

ENCLOSURE 3

WATTS BAR NUCLEAR PLANT (WBN)

REGULATORY GUIDE 1.97, REVISION 2
ADDITIONS/DELETIONS TO DEVIATION LIST

DEVIATION 11

VARIABLE (70)

Quench Tank (Pressurizer Relief Tank [PRT]) Temperature

DEVIATION FROM RG 1.97 R2 GUIDANCE

The range for this variable is recommended to be 50° to 750°F in accordance with RG 1.97, Revision 2. WBN recommends the range to be 50° to 400°F.

JUSTIFICATION

The purpose of this variable is to monitor operation. The PRT rupture disk is designed to operate between 86-100 psig. Assuming that the rupture disk operates at 100 psig and the pressurizer is at 2500 psig at saturated conditions, the maximum temperature during discharge when all valves in the line are open could be approximately 350°F. High temperature due to discharges or leakage into the tank from the pressurizer or other sources would produce an early upward trend in PRT temperature above normal. Temperatures far below the RG 1.97 recommended temperature of 750°F of the 400°F WBN recommended temperature would be sufficient to alert the operator to an abnormal condition and the potential need to check related PAM variables. Therefore, the recommended range of 50° to 400°F is sufficient to permit the operator to monitor plant operation.

DEVIATION 13

VARIABLE (91)

Auxiliary Building Exhaust Vent Radiation Level - Noble Gas Release

DEVIATION FROM RG 1.97 R2 GUIDANCE

The range recommended in RG 1.97 Revision 2, is 10^{-6} to 10^{3} microcuries/cubic centimeter (cc); the recommendation for WBN is 10^{-6} to 10^{-2} microcuries/cc.

JUSTIFICATION

The Auxiliary Building vent monitor is provided to continuously monitor the airborne radioactivity released through the Auxiliary Building exhaust vent. An accident causing Auxiliary Building radiation level to be high will cause all ventilation paths exhausting into the Auxiliary Building vent duct to automatically close and the Auxiliary Building gas treatment system to be activated. Because the isolation function occurs before accident-range activity is reached, a normal-range monitor only is employed to monitor activity in the Auxiliary Building exhaust vent. Therefore, the recommended range of 10^{-6} to 10^{-2} microcuries/cc is adequate for detecting and measuring noble gas concentrations.

DEVIATION 14
VARIABLE (93) - DELETED DEVIATION CONCERNING THIS VARIABLE

DEVIATION 32

VARIABLE (5)

Containment Sump Level (Wide Range)

DEVIATION FROM RG 1.97 R2 GUIDANCE

The range recommended in RG 1.97, Revision 2, is "Bottom of containment to 600,000-gallon level equivalent." Watts Bar recommends a range from 0-20 feet (with the "0" level starting at six inches* above the reactor floor).

JUSTIFICATION

Watts Bar utilizes a containment sump level monitoring system that starts measuring at six inches* above the containment floor (level tap located at elevation 703 feet 3-3/8 inches). The range of the instrument is 20 feet (723 feet 3-3/8 inches). The total volume of water available to flood containment post-LOCA is 844,000 gallons, which equals a maximum transient flood level of 720 feet 0 inches. Therefore, the recommended range is fully adequate to monitor the maximum flood level that would be experienced.

* The containment sump level monitoring system is utilized only during an accident. During normal operation reactor coolant leakage is monitored by the Reactor Building floor and equipment drain pocket sump. For postaccident monitoring, the operator is aware that the "0" level actually begins at 6-inches above the floor and will realize that there is extra water inside containment when the sump monitor begins to indicate.

DEVIATION 33

VARIABLE (95)

Condenser Vacuum Pump Exhaust Vent (Noble Gas)

DEVIATION FROM RG 1.97 R2 GUIDANCE

The RG 1.97 R2 required range for the condenser vacuum pump exhaust monitors is 1.0E-6 to 1.0E+5 μCi/cc.

JUSTIFICATION

TVA has determined the total gas required range of the condenser vacuum pump exhaust monitors to be 3.2E-7 to 3.5E+3 μCi/cc.

The steam generator tube rupture is the only credible accident monitored by the condenser vacuum pump exhaust monitor. NUREG-0800, Revision 2 requires that the tube rupture accident be analyzed using the highest isotope concentrations allowed by the Watts Bar Technical Specifications. The specific activity of the reactor coolant is limited to:

a) Less than or equal to 1 microcurie per gram dose equivalent Iodine-131, and

b) Less than or equal to $100/\bar{E}$ μCi/gm.

The Dose Equivalent I-131 is 4.95 times more restrictive than the $100/\bar{E}$ limit. The $100/\bar{E}$ limit is more conservative and is used for this calculation. The highest concentration of mixed noble gas isotopes that can be present under the $100/\bar{E}$ limit is 9.89E+2 μCi/cc as determined in TVA calculation WBNAPS-048. Therefore, the Watts Bar required range for the condenser vacuum exhaust monitor meets the intent of RG 1.97, Revision 2.

DEVIATION 34

VARIABLE (97c) & (97d)

Primary Coolant Dissolved Total Gas (97d) and Dissolved Oxygen (97c)

DEVIATION FROM RG 1.97 R2 GUIDANCE

RG 1.97, Revision 2 indicates the range for variable 97d is from 0 to 2000 cc/Kg and the range for Variable 97c is 0 to 20 ppm. The TVA required range for Variable 97d is 100-2000 cc/Kg, and 1 to 20 ppm for Variable 97c.

JUSTIFICATION

The TVA required ranges for Variable 97c and 97d permit adequate assessment of the primary system for these dissolved gases, and therefore, meets the intent of RG 1.97.

DEVIATION 35

VARIABLE (20)

Control Rod Position

DEVIATION FROM RG 1.97 R2 GUIDANCE

RG 1.97 recommends that control rod position indication be a Type B, Category 3 variable (B3) to monitor for reactivity control. Watts Bar recommends that this variable be a Type D, Category 3 Variable (D3).

JUSTIFICATION

Control rod position indication is an indirect variable, It provides backup indication for monitoring reactivity control. Neutron flux (Category 1) is a direct variable that allows the operator to determine if reactivity is under control (i.e., the reactor has tripped and the core is in a subcritical condition). Since this provides backup indication, utilizing it as a Type D variable is sufficient.

DEVIATION 36

VARIABLE (4)

Containment Area Radiation, High Range

DEVIATION FROM RG 1.97 R2 GUIDANCE

Note 7 of RG 1.97, Revision 2 for the subject variable states, "detectors should respond to gamma photons within any energy range from 60KeV to 3MeV with an energy response accuracy of 20% at any specific photon energy from 0.1MeV to 1MeV. Overall system accuracy should be within a factor of 2 over the entire range. TVA meets the requirements of RG 1.97 Revision 3, Note 7 for the subject variable, which states, "Detectors should respond to gamma radiation photons within any range from 60KeV to 3MeV with a dose rate response accuracy within a factor of 2 over the entire range."

JUSTIFICATION

It is acceptable to meet the requirements of RG 1.97, Revision 3.

DEVIATION 37

VARIABLE 6

Core Exit Temperature

DEVIATION FROM RG 1.97 R2 GUIDANCE

This Type A, Category 1 variable has been provided with a minimum of two independent channels (PAM 1 and PAM 2) for monitoring core exit temperature. Where failure of a channel would present ambiguous or confusing information to the operator, preventing the operator from taking action or misleading the operator, RG 1.97 recommends that an additional redundant (PAM 3) channel be provided. One channel of the WBN core exit temperature indication is subject to direct failure as a result of a specific pipe break jet impingement and/or pipe whip impact on the cable/conduit routed near the safety injection (SI) accumulator cold leg injection line in Loop 1. The WBN design does not include a third redundant channel for this variable.

JUSTIFICATION

The core exit thermocouples were added to the plant design to provide direct indication of degrading core cooling conditions following transient events similar to that experienced at Three Mile Island (TMI). These events typically develop gradually over time and involve a great deal of operator action and control. The core exit temperature indication was intended to prevent erroneous operator termination of emergency core cooling system (ECCS) flow to the reactor coolant system (RCS) after small breaks or transients that do not rapidly depressurize the RCS.

The challenge to the channel redundancy in this case is due to a specific primary loop pipe break at the cold leg injection check valve. The injection line is 10-inches diameter, schedule 140 pipe and the postulated break is a full guillotine rupture which results in a blowdown flow area from the primary loop side of the break of 60 in^2 or 0.4176 ft^2. This break is included in the loss-of-coolant-accident (LOCA) break size spectrum and is considered an intermediate size break. FSAR Chapter 15 analyses show that breaks in this range rapidly depressurize the primary system, causing automatic ECCS response which refloods the core and terminates the core heatup transient. However, should such a break occur, the affected channel is expected to fail open and not give erroneous indication that could confuse the operators.

It is the WBN position that the RG 1.97 R2 indication provided by reactor vessel level, RCS pressure, RCS temperatures T_{hot} and T_{cold}, and containment pressure and temperature will enable the operators to compensate for a loss of one channel of CET due to this specific pipe break plus a single failure of the redundant channel. The operators will be able to correctly assess the accident scenario and determine the effectiveness of postaccident core cooling system response during performance of the Emergency Operating Procedures.