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SUBJECT: Forwards comments on Revision 2 to Reg Guide 1.97 & results of facility design review relative to proposed guide.

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February 1, 1980

Docket No. 50-397

G02-80-29

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

Subject: WPPSS NUCLEAR PROJECT NO. 2
DRAFT 2 of REG. GUIDE 1.97

Dear Mr. Denton:

On December 14, 1979, WPPSS and other near-term OL BWR Owners met with your staff to discuss the proposed revision 2 to Regulatory Guide 1.97 with respect to their BWR plants. At the meeting there were many detailed comments of the various parameters in Table 3, "BWR Variables", and we were asked to put the comments in writing, especially with relationship to our own specific plant designs. Attachment I is a list of our comments from the aspect of our own WNP-2 Plant (a BWR). Due to the potential significance and backfit considerations relative to complete compliance with the proposed guide on WNP-2, we have spent a great deal of effort in reviewing the WNP-2 design relative to the proposed guide. Attachment II documents for you the results of this review including estimated cost information (not including cost of schedule slippage). We feel that Attachment II must be reviewed carefully by you to understand the basis for our general comments on the guide in Attachment I. Attachment III is a mark-up of the guide itself.

We hope this information is useful to you in development of the Reg. Guide and we hope you consider them carefully. We would welcome a

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meeting with you at any time to discuss these comments. We expect to provide further comments on the guide from the aspect of our PWR plants in the near future.

Very truly yours,

D. L. RENBERGER
Assistant Director
Technology

DLR:OKE:cph

Attachments:
1. Comments on Rev. 2 to R. G. 1.97
2. Comments on R.G. 1.97 Table 3 Variables
3. Mark-up of R.G. 1.97

cc w/att:
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RC Root - Burns & Roe/Site
JR Lewis - Bonneville Power Adm.
ND Lewis - EFSEC/Olympia
WNP-2 Files

Attachment I

COMMENTS ON REVISION 2 TO REG. GUIDE 1.97
FROM THE ASPECT OF WNP-2 (BWR 5/MK II)

1. The WNP-2 Plant is in substantial compliance with the intent of the guide. Review of Attachment II shows that almost all variables requested are monitored appropriately in the WNP-2 design. Variables which aren't explicitly monitored are covered by another parameter (e.g. core exit temperature on a BWR is really adequately monitored by vessel level).

2. The amount of backfit and cost of implementation for complete compliance with R. G. 1.97 on WNP-2 would be large. Attachment II indicates the estimated costs and work to be done for complete compliance for the individual items. The total estimated cost not taking into account any costs of schedule impacts or costs of money is approximately $11,000,000. If schedule impacts occur, these costs are large and could easily cause the estimated costs to double and triple. The reason for this is WNP-2 is essentially complete as far as any backfit considerations is concerned and, in this regard, is effectively the same as an operating plant. By and large the greatest component to costs is labor. Equipment and material costs are relatively small. However, qualification of equipment with the necessary documentation and QA increases material cost by order of magnitude.

3. The impacts of the guide are in the details of implementation which do not increase safety margins significantly. Though WNP-2 is in substantial compliance with the guide, the backfit effort and implementation costs are large due to details, i.e., providing emergency power for an instrument, upgrading qualification and QA documentation, changing ranges, providing redundancy, monitoring one specific variable rather than another. These changes in most instances do not in reality increase safety margins significantly.

4. Reg. Guide 1.97 is too prescriptive and doesn't focus enough on criteria. The table 3 variables in essence would become a "bible". Innovative thought on post-accident monitoring is thus stifled. It would be better to provide criteria and request documentation of the design to such criteria in the SAR. Appropriate criteria are generally in ANS 4-5. The table 3 variables should be used as examples.

5. Reg. Guide 1.97 is being too prescriptive contains requirements which in instances are arbitrary, in error, in conflict with current NRC guidance, and not adequately justified. See attachment II for specifics. The instrument quality and design requirements in Table I should be carefully justified. They should be commensurate with the safety function or parameter being monitored. For example, there is no reason for upgrading design requirements in Table I beyond the reasoned approach of ANS 4.5. Lack of attention in this area increases costs unjustifiably and unnecessarily without commensurate increases in safety.

COMMENTS ON REG. GUIDE 1.97
TABLE 3 VARIABLES

Legend

Y - Yes

N - No

CB - Critical Buss

4.11, 279 - 1971 - Refer to Note 8 of Table 1 of Reg. Guide 1.97

App B - App B of 10CFR50

Con or Cont - Continuous

Rec - Recorder

Ind - Indicator

OD - On Demand

UPS - Uninterruptible Power Supply

Qual. to cond. of op - Qualified to Conditions of Operation

N/A - Not Applicable

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Core Exit Temperature

A. Range - 150°F - 2300°F
B. Type - B, C
C. Purpose - To provide incore temperature measurements to identify localized hot areas. (Approximately 50 measurements)

II. WNP-2 Design

A. Instrument Range } No instrument of this type exists at WNP-2.

B. WNP-2 Design }

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	y	N/A
2. Sing. failure per RG 1.53	y	
3. Env. qual. per RG 1.89	y	
4. Power Source	CB	
5. Out of Service interval	4.11, 279-1971	
6. Portable	N	
7. QA level	App.B	
8. Display type	CON	
9. Display method	REC	
10. Unique Identification	y	
11. Periodic testing per RG 1.118	y	

III. Changes Required for Full Compliance, Cost, Schedule

Thermocouples would have to be installed in the in-core monitor strings (LPRM's) at 4 elevations in the core. Designing for single failure, etc. would be difficult and separation problems would arise under the vessel. Require unique identification GE estimates $600,000 and 21-32 months to design, purchase and install the equipment. FIELD CONSTRUCTION AND LABOR COSTS ARE estimated to be APPROX. $697,000. Total cost estimate equals $1,297,000.00

IV. Comments

This variable is of little value in a BWR since core coverage virtually guarantees Fuel integrity.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Control Rod Position [4]

A. Range - Full in or not Full in
B. Type - D
C. Purpose - To provide position indication that the control rods are fully inserted (Minimum of 2 hours after accident)

II. WNP-2 Design

A. Instrument Range - Full in

B. WNP-2 Design - Lights for all rods on full core display

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N (1)
3. Env. qual. per RG 1.89	Y	N (2)
4. Power Source	Emerg. Power	UPS
5. Out of Service interval	4.11, 279-1971	IN STD TECH SPECS
6. Portable	N	N
7. QA level	App.B	N
8. Display type	OD	Cont.
9. Display method	IND	LIGHTS
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	Y	N (3)

III. Changes Required for Full Compliance, Cost, Schedule

Would require environmental qualification of RPIS EQUIPMENT TO INCLUDE PORTIONS of the computer (multiplexer) and cabling. Qualification of sensors and cabling in containment would have to be documented. GE estimates $300,000 and 16 months to upgrade the system. CONSTRUCTION AND LABOR COSTS = $23,000. Total cost estimate equals $319,000.00.

IV. Comments

1. WPPSS uses the process computer as a back-up indicator.
2. The 200 day qual. std. makes no sense for this instrument.
3. A certain amount of testing may be performed in line with Tech Specs to meet the intent of R.G.1-118.
4. Rod position indication is not justified as a Type D variable. There are many other indicators available to confirm scram. Operators are taught to check these variables as a priority action in operator training.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Neutron Flux

A. Range - 1 c/s to 1% power
B. Type - B
C. Purpose - ANS-4.5, section 6.2.2 For indication of approach to criticality

II. WNP-2 Design

A. Instrument Range - 10^{-1} to 10^{6} cps

B. WNP-2 Design - Monitored by Source Range Monitors (SRM's)

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	N
2. Sing. failure per RG 1.53	Y	N (1)
3. Env. qual. per RG 1.89	Y	N
4. Power Source	CB	UPS for Display, N for DRIVE
5. Out of Service interval	4.11,279-1971	IN TECH SPECS
6. Portable	N	N
7. QA level	App B	N
8. Display type	CON	CON WHILE IN CORE
9. Display method	REC	REC
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	N (2)

III. Changes Required for Full Compliance, Cost, Schedule

Would require seismic and environmental qualification of instrument and detector drive. Drive would require total redesign to bring it to quality standards. Drive power source would require change - presently no IE 34 power available. Require unique ident. GE estimates $360,000 and 18-24 months to perform upgrade. CONSTRUCTION AND LABOR COSTS = $18,000. Total Cost estimate equals $378,000.00.

IV. Comments

1. Have 4 SRM's from divisionalized power so, it is in partial compliance with R.G. 1-53 intent.

2. Can perform checks in SRM in-core per Tech Specs. meet intent of R.G.1-118

   Many unknowns with this item - GE would assume drive would have to be operable for 2 hours only - ie, just long enough to drive the SRM's into the core and leave them there.
   A better solution might be an ex-vessel monitor in the annulus between the sacrificial shield and the vessel.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Reactor Vessel Pressure

A. Range - 15 psig - 2000 psig
B. Type - B, C
C. Purpose - ANS-4.5, Sections 6.2.3,6.2.4, 6.3.3 and 6.3.5 - For indication of an accident and to indicate that action must be taken to mitigate an event.

II. WNP-2 Design

A. Instrument Range - 0 - 1500 psig

B. WNP-2 Design - Redundant Pressure Recorders

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y (1)
2. Sing. failure per RG 1.53	Y	Y
3. Env. qual. per RG 1.89	Y	Y (1)
4. Power Source	CB	UPS
5. Out of Service interval	4.11,279-1971	IN TECH SPEC
6. Portable	N	N
7. QA level	APP. B	APP.B
8. Display type	CON	CON
9. Display method	REC	REC
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y

III. Changes Required for Full Compliance, Cost, Schedule

Recorder has been seismicly qualified by type only. Requires range change. Instrument can be respanned without replacement. Recorder scale must be changed. Require unique ident. GE ESTIMATES $250,000. ESTIMATED CONSTRUCTION AND LABOR COSTS = $48,000. Total cost estimate equals $298,000.

IV. Comments

1. TRANSMITTERS qualified to 1971 criteria. Qualification under review.
RECORDER QUALIFIED BY TYPE TEST ONLY
Maximum pressure reached in analysis is ~1250 psig for an ATWS.
1500 psig should be adequate then.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Coolant Level in the Reactor

A. Range - Bottom of core support plate to above top of discharge plenum
B. Type - B
C. Purpose - ANS-4.5, Section 6.2.3, for indication of fuel submergency for a LOCA event.

II. WNP-2 Design

A. Instrument Range - -150" to 60"

B. WNP-2 Design - Redundant level recorders from 1 ft. above active fuel to just below steam line discharge. (1)

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y (2)
2. Sing. failure per RG 1.53	Y	Y
3. Env. qual. per RG 1.89	Y	Y (2)
4. Power Source	CB	UPS
5. Out of Service interval	4.11,279-1971	IN TECH SPECS
6. Portable	N	N
7. QA level	APP. B	APP.B ?
8. Display type	CON	CON
9. Display method	REC	REC
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y

III. Changes Required for Full Compliance, Cost, Schedule

To cover the active Fuel zone, additional instruments and taps to the vessel will be required. One tap could be off the Standby Liquid Control System. Another tap would have to be added. Require unique identification GE estimates $800,000 and 24-36 months for design, purchase and installation of equipment which would compensate for fuel zone level instrumentation inaccuracy. ESTIMATE CONSTRUCTION AND LABOR COSTS = $48,000. Total cost estimate equals $848,000.

IV. Comments

1. Refueling level indicator covers range of core but is redundant but taps off jet pump. Is not accurate with flow through jet pumps (±12").

2. Transmitter qual to 1971 criteria (under review) - RECORDERS QUALIFIED BY TYPE TEST ONLY
The single new instrument with a tap off the SBLCS in conjunction with the existing refueling level indicator (accuracy ±12") should be sufficient and would cost less than complete compliance as indicated by GE.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Main Steamline Flow

A. Range - 0 -120% design Flow (4.29×10^6 lb/hr)
B. Type - B
C. Purpose - To provide an indication of the integrity of the pressure boundary

II. WNP-2 Design

A. Instrument Range - 0 - 4.25×10^6 lb/hr

B. WNP-2 Design - One flow indicator on each mainsteam line

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	N
2. Sing. failure per RG 1.53	Y	N
3. Env. qual. per RG 1.89	Y	N
4. Power Source	CB	UPS
5. Out of Service interval	4.11,279-1971	NOT IN TECH SPECS
6. Portable	N	N
7. QA level	APP. B	NO
8. Display type	CON	CON
9. Display method	REC	IND
10. Unique Identification	Y	NO
11. Periodic testing per RG 1.118	Y	YES

III. Changes Required for Full Compliance, Cost, Schedule

Requires seismic and environmental qualification of transmitters and instrument power supplies. Redundent transmitters would have to be provided. Require unique ident. Indicators would have to be replaced with redundant, qualified recorders. GE estimates $250,000 and 15-21 months for upgrade. ESTIMATED CONSTRUCTION AND LABOR = $96,000. Total cost estimate equals $346,000.

IV. Comments

This instrument is not useful for the purpose stated. Useful only during first few seconds while there is steam flow and this is dependent on location of sensor. MSIV position indication and the MSIV-LCS provide sufficient redundancy and diversity to meet the intent.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - MSIV - Leakage Control System

A. Range - 0 - 15" H_2O, 0-5 psid
B. Type - B
C. Purpose - To provide an indication of the pressure boundary and containment

II. WNP-2 Design

A. Instrument Range - 0 - 50 psig, 0 - 0.5 CFM

B. WNP-2 Design - Single pressure indicator for inboard and single indicator for outboard one flow indicator per system.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	NO (1)
2. Sing. failure per RG 1.53	Y	NO (1) (2)
3. Env. qual. per RG 1.89	Y	NO (1)
4. Power Source	CB	UPS
5. Out of Service interval	4.11,279-1971	IN TECH SPECS
6. Portable	N	N
7. QA level	APP. B	APP. B
8. Display type	CON	CON
9. Display method	REC	IND
10. Unique Identification	Y	NO
11. Periodic testing per RG 1.118	Y	Y

III. Changes Required for Full Compliance, Cost, Schedule

Replace indicators with seismically qualified recorders. Require an additional flow sensor and recorder for outboard system. Require unique ident. perform seismic and environmental qualification on sensors. GE estimates $140,000 and 12-18 months to upgrade. CONSTRUCTION AND LABOR COSTS = $90,000. Total cost estimate equals $230,000.00

IV. Comments

1. TRANSMITTERS are qualified to 1971 criteria. Qualification is under review.

2. Single failure criteria applies only on a system basis, ie, single indicator for a single system.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Primary System Safety Relief Valve Position

A. Range - Closed - not closed or 0 to 50 psig
B. Type - B, D
C. Purpose - By these measurements, the operator knows if there is a path open for loss of coolant and if an event may be in progress.

II. WNP-2 Design

A. Instrument Range - Closed - open

B. WNP-2 Design - Non-redundant close-open indication from logic (ADS) Temperature sensor on tailpipe.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	N (1)
2. Sing. failure per RG 1.53	Y	N (1)(3)
3. Env. qual. per RG 1.89	Y	N (1)
4. Power Source	CB	UPS
5. Out of Service interval	4.11,279-1971	IN TECH SPECS
6. Portable	N	N
7. QA level	APP.B	APP. B
8. Display type	CONT	LIGHTS-CONT
9. Display method	REC	I
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y (2)

III. Changes Required for Full Compliance, Cost, Schedule

Install redundant acoustic monitors which are qualified seismically and environmentally (Redundancy may not be a requirement in light of Lessons Learned discussions). Require unique ident. estimated cost - $425,000 with no schedule impact. Cost estimated during TMI Lessons learned effort.

IV. Comments

1. ADS valves are qualified to 1971 criteria and are redundant. (1971 criteria under review)
2. Partial compliance in line with TECH SPEC surveillance requirements.
3. NUREG 0578 does not require single failure proof instrumentation. Back-up will be tailpipe thermocouples.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Radiation Level in Coolant

A. Range - 10 μCi/cc - 10 Ci/cc
B. Type - C
C. Purpose - ANS-4.5, Section 6.3.2. For early indication of Fuel cladding Failure and estimate of extent of damage.

II. WNP-2 Design

A. Instrument Range - No current instrument. (1)
B. WNP-2 Design - Area Monitors, Main Steam Line radiation Monitors, off-gas pretreatment monitor sampling satisfy intent.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	N/A 1
2. Sing. failure per RG 1.53	Y	
3. Env. qual. per RG 1.89	Y See 6.3.6 of ANS 4-5	
4. Power Source	4.11,279-71	
5. Out of Service interval	NO-but may be portable	
6. Portable	APP.B outside containment	
7. QA level	CON	
8. Display type	REC	
9. Display method	Y	
10. Unique Identification	Y	
11. Periodic testing per RG 1.118		

III. Changes Required for Full Compliance, Cost, Schedule

Install new redundant, qualified monitors adjacent to pipes carrying activity (could be outside containment next to RHR, LPCS,LPCZ loops). Require unique ident. as part of TMI, sampling capability needs to be upgraded to handle 10 Ci/cc. Monitors have to be calibrated to expected activity in the coolant. ESTIMATED COST - $205,000.

IV. Comments

1. Main Steam radiation monitors (which IE, redundant, qualified, etc.) and the off-gas pre-treatment monitor meet the intent of this instrument for immediate detection of Fuel failure. After isolation true levels of coolant activity may only be taken by sampling. Indirect measurements of activity may be taken by area monitors in vicinity of RHR piping.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Primary Containment Pressure

A. Range - 10 psia to 3x design press for concrete or 4x design press for steel
B. Type - B,C
C. Purpose - ANS-4.5, Section 6.2.5, 6.3.3, 6.3.4 and 6.3.5. For indication of the integrity of the primary containment pressure boundary, to indicate the potential for leakage from the containment.

II. WNP-2 Design

A. Instrument Range - 0 - 2 psig
0 - 100 psig
B. WNP-2 Design - Redundant pressure recorders are provided.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y (1)(2)
2. Sing. failure per RG 1.53	Y	Y
3. Env. qual. per RG 1.89	Y	Y (1)
4. Power Source	CB	UPS
5. Out of Service interval	4.11,279-71	IN TECH SPECS
6. Portable	N	N
7. QA level	APP.B	APP.B
8. Display type	CONT	CONT
9. Display method	REC	REC.
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y

III. Changes Required for Full Compliance, Cost, Schedule

Change ranges on both instruments. Requires unique ident. Requires requalification. CONSTRUCTION AND LABOR COSTS - $8,000. Requalification cost = $70,000. Total cost estimate - $78,000.

IV. Comments

1. Qualified to 1971 criteria (under review)
2. Recorders are seismically qualified by type only.

Monitoring more than 10% over design pressure is not useful. 100 psig for WNP-2 is over 2x design pressure. It would not be prudent to allow containment pressures to exceed design allowables by any appreciable margins. Venting through filters under such conditions (which have not been hypotherized) would be much preferrable to allowing potential containment breach by excessive pressure.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - PRIMARY CONTAINMENT H_2 Concentration

A. Range - 0 - 10%
B. Type - B,C
C. Purpose - ANS-4.5, Sections 6.25, 6.35. For indication of the need for and a measurement of the performance of the containment hydrogen recombiner and to verify operation of the mixing system.

II. WNP-2 Design

A. Instrument Range - 0 - 10%

B. WNP-2 Design - Redundant H_2 monitors and recorders.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y 1
2. Sing. failure per RG 1.53	Y	Y
3. Env. qual. per RG 1.89	Y	Y 1
4. Power Source	CB	UPS
5. Out of Service interval	4.11,279-71,	IN TECH SPECS
6. Portable	N	N
7. QA level	APP,B	APP.B
8. Display type	CONT	CONT
9. Display method	REC	REC
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y 2

III. Changes Required for Full Compliance, Cost, Schedule

Requires unique ident. and requalification (or purchase new monitors). Estimated total cost $78,000.

IV. Comments

1. Qualified to 1971 criteria (under review)

2. As per Tech Specs.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - PRIMARY CONTAINMENT O_2 Concentration (for plants with inerted containments)

A. Range - 0 - 10%
B. Type - B, C
C. Purpose - For indication of the need for and a measurement of the containment O_2 elimination system.

II. WNP-2 Design

A. Instrument Range - 0 - 25%

B. WNP-2 Design - Redundant O_2 monitors and recorders

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y 1
2. Sing. failure per RG 1.53	Y	Y
3. Env. qual. per RG 1.89	Y	Y 1
4. Power Source	CB	UPS
5. Out of Service interval	4.11,279-71	IN TECH SPECS
6. Portable	N	N
7. QA level	APP.B	APP.B
8. Display type	CONT	CONT
9. Display method	REC	REC
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y 2

III. Changes Required for Full Compliance, Cost, Schedule

Requires unique ident. and requalification (or purchase new monitors).
Estimated total cost = $78,000.00

IV. Comments

1. Qualified to 1971 criteria (under review)

2. As per Tech Specs.

WNP-2 Containment is currently not inerted.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Primary Containment Isolation Valve Position

A. Range - Closed - Not closed
B. Type - B, D
C. Purpose - ANS-4.5, Section 6.2.5. To indicate the status of containment isolation and to provide information on the status of values in process lines that could carry radioactive materials out of containment.

II. WNP-2 Design

A. Instrument Range - Open/Closed

B. WNP-2 Design - Open/closed lights for each remote operable containment isolation valve. Manual valves are locked closed or open

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y (1)
2. Sing. failure per RG 1.53	Y	Y (2)
3. Env. qual. per RG 1.89	Y	Y (1)
4. Power Source	CB	DIESEL (3)
5. Out of Service interval	4.11,1971,	PER TECH SPECS
6. Portable	N	N
7. QA level	APP.B	APP.B
8. Display type	CONT	CONT
9. Display method	REC	IND
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y (4)

III. Changes Required for Full Compliance, Cost, Schedule

Indicators require seismic qualification. Require unique identification. CONSTRUCTION, MATERIAL, ENGINEERING AND LABOR COSTS = $240,000. 12-18 months required to procure, upgrade and install.

IV. Comments

1. Qualified to 1971 criteria (under review). Indicators (lights) are not qualified.
2. Meets single failure on system basis, ie, one indicator per valve. Have inside and outside valves.
3. Some indicators and relays were supplied from non - IE sources - This is being revised.
4. Meets intent through TECH SPEC surveillance.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Suppression Pool Water Level

A. Range - Top of vent to top of weir well ④
B. Type - B
C. Purpose - ANS-4.5, Section 6.3.3

II. WNP-2 Design

A. Instrument Range - -25" to +25" (0 = Normal level)

B. WNP-2 Design - Redundant Suppression Pool Level Recorders

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y ①②
2. Sing. failure per RG 1.53	Y	Y
3. Env. qual. per RG 1.89	Y	Y ①
4. Power Source	CB	UPS
5. Out of Service interval	4.11.279-1971	IN TECH SPECS
6. Portable	N	N
7. QA level	APP.B	APP.B
8. Display type	CONT	CONT
9. Display method	REC	REC
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y ③

III. Changes Required for Full Compliance, Cost, Schedule

Range needs to be increased. Recorders are type tested only. Require unique ident. BWR owners group has committed to monitor water level to the lowest ECCS suction pt. COST FOR MATERIAL, ENGINEERING, CONSTRUCTION AND LABOR equal $35,000. Cost for requalification to current standards = $78,000.00 Total cost estimate equals $113,000.00

IV. Comments

1. Qualified to 1971 criteria (under review)
2. Recorders are qualified by type only.
3. Per Tech Spec
4. Item was apparently written for a BWR-6/Mark III

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Suppression Pool Water Temperature

A. Range - 50°F - 250°F
B. Type - B
C. Purpose - To ensure proper temperature for NPSH of ECCS. To verify operation of the makeup system.

II. WNP-2 Design

A. Instrument Range - 50°F - 400°F

B. WNP-2 Design - Redundant temp recorders - monitors 24 points (24 sets of 2 thermocouples each)

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y (2)
2. Sing. failure per RG 1.53	Y	Y
3. Env. qual. per RG 1.89	Y	Y
4. Power Source	CB	UPS
5. Out of Service interval	4.11 279-1971	PER TECH SPECS
6. Portable	N	N
7. QA level	APP. B	APP.B
8. Display type	CONT	CONT.
9. Display method	REC	REC
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y (1)

III. Changes Required for Full Compliance, Cost, Schedule

Requires unique identification. Cost is minor. Current design meets NRC criteria.

IV. Comments

1. As feasible by Tech Spec surveillance requirements.

2. Recorders are seismically qualified by Type only.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Drywell Pressure (1)

A. Range - 12 psia - 3 psig, 0-110% design
B. Type - B, E
C. Purpose - ANS-4.5 Section 6.3.3. Diagnosis of impact of accident on structure.

II. WNP-2 Design

A. Instrument Range - Same as Containment pressure.

B. WNP-2 Design

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100		
2. Sing. failure per RG 1.53		
3. Env. qual. per RG 1.89		
4. Power Source		
5. Out of Service interval		
6. Portable		
7. QA level		
8. Display type		
9. Display method		
10. Unique Identification		
11. Periodic testing per RG 1.118		

III. Changes Required for Full Compliance, Cost, Schedule

None - item N/A

IV. Comments

1. Item apparently refers to BWR 6/Mark III application - N/A for BWR 5/Mark II.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Drywell Drain Sump Level (Ident. and Unident. Leakage)

A. Range - Bottom to top
B. Type - B, C
C. Purpose - ANS-4.5, Section 6.3.3

II. WNP-2 Design

A. Instrument Range } See Note (1)

B. WNP-2 Design }

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100		
2. Sing. failure per RG 1.53		
3. Env. qual. per RG 1.89		
4. Power Source		
5. Out of Service interval		
6. Portable		
7. QA level		
8. Display type		
9. Display method		
10. Unique Identification		
11. Periodic testing per RG 1.118		

III. Changes Required for Full Compliance, Cost, Schedule

None - item N/A

IV. Comments

1. This item apparently written for BWR 6/Mark III application. Sump drains in BWR 5/Mark II to outside containment and the line is isolated on containment isolation - Leakage would end up in Suppression Pool.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - High Range Containment Area Radiation

A. Range - $1\text{-}10^7$ R/M (60 KeV to 3MeV with ±20% accuracy)
B. Type - B, C
C. Purpose - To help identify if an accident has degraded beyond calculated values and to indicate its magnitude in order to determine action to protect the public.

II. WNP-2 Design

A. Instrument Range - $-01 - 10^4$ R/m (equivalent to 10^7 R/m in containment except Xe^{133}).
B. WNP-2 Design - Redundant ion chambers set in biological shield wall outside containment.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y 1
2. Sing. failure per RG 1.53	Y	Y
3. Env. qual. per RG 1.89	Y	Y 1
4. Power Source	CB	UPS
5. Out of Service interval	4.11,279-71,	PER TECH SPECS
6. Portable	N	N
7. QA level	APP.B	APP.B
8. Display type	CONT	CONT
9. Display method	REC	REC
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y 2

III. Changes Required for Full Compliance, Cost, Schedule

To gain sensitivity requirement, additional redundant, qualified monitors would have to be placed inside containment with an expanded range (probably would require two overlapping detectors).③ Unique Ident. is required. Total cost for new detectors, labor, installation is $600,000.

IV. Comments

1. Seismic and Environmental Qualification to 1971 standards (under review) RECORDERS QUALIFIED BY TYPE ONLY
2. Per TECH SPECS
3. WNP-2 meets the intent of these instruments with the ex-containment design and feels strongly that the additional expense of in-containment monitors is not warranted. The present monitors are located directly next to the steel containment and will be calibrated to read in-containment doses. These readings combined with gas samples will provide the sensitivity required.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Main Feedwater Flow

A. Range - 0-110% design flow
B. Type - E
C. Purpose - To indicate an adequate source of water to the reactor

II. WNP-2 Design

A. Instrument Range - 0 to 8.5 x 10^6 lb/hr

B. WNP-2 Design - One flow indicator per feedwater line

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(QUAL TO COND OF OP)	N
4. Power Source	EMERG PWR	UPS (1)
5. Out of Service interval	N	N
6. Portable	N	N
7. QA level	APP.B	N (2)
8. Display type	OD	CONT
9. Display method	IND	IND
10. Unique Identification	NO	NO
11. Periodic testing per RG 1.118	NO	NO

III. Changes Required for Full Compliance, Cost, Schedule

Upgrade QA documentation on Feedwater monitors. Estimated cost = $6000. (assuming new monitors do not have to be purchased).

IV. Comments

1. Even though the feedwater indicators are supplied from emergency power, it makes no sense to require it since the system itself is not.

2. The QA level of the feedwater system is not QA Class I (App.B) so it makes no sense to require the indicators to be. If feedwater is being used, there are other class I instruments available to verify injection (IE, vessel level).

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Condensate Storage Tank Level

A. Range - Bottom to Top
B. Type - E
C. Purpose - To indicate available water for core cooling

II. WNP-2 Design

A. Instrument Range = 0-35 ft.

B. WNP-2 Design - One level indicator per tank (2 tanks)

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(QUAL TO COND OF OP)	N
4. Power Source	EMERG PWR	UPS
5. Out of Service interval	N	N
6. Portable	N	N
7. QA level	APP.B	APP.B (1)
8. Display type	OD	CONT
9. Display method	IND	IND
10. Unique Identification	NO	NO
11. Periodic testing per RG 1.118	NO	NO

III. Changes Required for Full Compliance, Cost, Schedule

Upgrade QA documentation for CST level monitors. Estimated cost = $6000. (assuming new monitors do not have to be purchased).

IV. Comments

1. It doesn't make sense to require QA Class I requirements for these instruments since the system is not. RCIC and HPCS have Class I instruments which cause switch over of pump suction to the suppression pool in the event of loss of suction.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Containment Spray Flow

A. Range - 0 to 110% design
B. Type - D
C. Purpose - For indication of system Operation

II. WNP-2 Design

A. Instrument Range -
B. WNP-2 Design

} Same as RHR System Flow (1)

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N/A
2. Sing. failure per RG 1.53	N	
3. Env. qual. per RG 1.89	Y	
4. Power Source	EMERG PWR	
5. Out of Service interval	PER TECH SPEC	
6. Portable	N	
7. QA level	APP.B	
8. Display type	OD	
9. Display method	IND	
10. Unique Identification	N	
11. Periodic testing per RG 1.118	Y	

III. Changes Required for Full Compliance, Cost, Schedule

Four new monitors (2 for drywell spray loops, 2 for wetwell spray loops) appropriately qualified would be required. Estimate ~ $200,000 for cost and labor for new monitoring system.

IV. Comments

1. Valve position plus RHR flow indicates spray flow.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Steam Flow to RCIC

A. Range - 0-110% Design
B. Type - E
C. Purpose - To verify that adequate steam is available for the sytem to perform its function.

II. WNP-2 Design

A. Instrument Range -
B. WNP-2 Design -

} Variable is not monitored at WNP-2 (or in other BWR-4,5,6 designs) (1)

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N/A
2. Sing. failure per RG 1.53	N	
3. Env. qual. per RG 1.89	N(QUAL TO COND OF OP)	
4. Power Source	EMERG PWR	
5. Out of Service interval	N	
6. Portable	N	
7. QA level	APP.B	
8. Display type	OD	
9. Display method	IND	
10. Unique Identification	NO	
11. Periodic testing per RG 1.118	NO	

III. Changes Required for Full Compliance, Cost, Schedule

Requires addition of flow element, transmitter, recorder with appropriate qualification and QA. GE estimates $210,000 with 12-18 months delivery. CONSTRUCTION, MATL. AND LABOR COSTS = $60,000. Total cost estimate equals $250,000.

IV. Comments

1. Steam Line pressure is monitored and provides equivalent information.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - RCIC Flow

A. Range - 0 - 110% Design
B. Type - D
C. Purpose - For indication of system Operation

II. WNP-2 Design

A. Instrument Range - 0 - 700 GPM (678 gpm)

B. WNP-2 Design - Single set of Flow monitoring instrumentation

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	Y	Y 1
4. Power Source	EMERG PWR.	UPS
5. Out of Service interval	PER TECH SPEC	PER TECH SPEC
6. Portable	N	N
7. QA level	APP B	APP B
8. Display type	OD	CONT
9. Display method	IND	IND
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	Y	Y

III. Changes Required for Full Compliance, Cost, Schedule

Qualification upgrade to current criteria. Estimated cost is $78,000.00

IV. Comments

1. Qualified to 1971 criteria (does not meet 200 day qual) (Qual under review)

Reg. Guide 1.97 - Table 3 Variables

I. Variable - RHR System Flow

A. Range - 0 to 110% design (8690gpm)
B. Type - D
C. Purpose - For indication of system operation

II. WNP-2 Design

A. Instrument Range - 0-10,000gpm

B. WNP-2 Design - Single set of flow monitoring instrumentation per loop.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	Y	Y 1
4. Power Source	EMERG PWR	UPS
5. Out of Service interval	PER TECH SPEC	PER TECH SPEC
6. Portable	N	N
7. QA level	APP.B	APP.B
8. Display type	OD	CONT
9. Display method	IND	IND
10. Unique Identification	NO	N
11. Periodic testing per RG 1.118	Y	Y

III. Changes Required for Full Compliance, Cost, Schedule

Qualification upgrade to current criteria. Estimated cost is $78,000.00

IV. Comments

1. Qualified to 1971 criteria (does not meet 200 day qual)(Qual under review)

Reg. Guide 1.97 - Table 3 Variables

I. Variable - RHR Heat Exchanger Outlet Temperature

A. Range - 32°F to 350°F
B. Type - D
C. Purpose - For indication of system operation[1]

II. WNP-2 Design

A. Instrument Range - -0-600°

B. WNP-2 Design- One monitor per heat exchanger loop

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	Y	N
4. Power Source	Emerg Power	N
5. Out of Service interval	per tech spec	N
6. Portable	N	N
7. QA level	APP B	N
8. Display type	OD	Cont
9. Display method	IND	REC
10. Unique Identification	No	N/A
11. Periodic testing per RG 1.118	Y	No

III. Changes Required for Full Compliance, Cost, Schedule

Requires appropriate qualification, QA on sensors, power source must be changed to come off of an emergency buss. Est-cost for construction and labor is $860,000. Qualification upgrade estimated at $78,000. Total cost estimate equals $138,000.

IV. Comments

[1] This variable if of little use. Primary coolant pressure, RHR flow and service water flow yield desired information.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Service Cooling Water Temp.

A. Range - 32°F - 200°F
B. Type - D
C. Purpose - For indication of system operation [2]

II. WNP-2 Design

A. Instrument Range - } WNP does not have such an instrument [1]
B. WNP-2 Design }

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N/A
2. Sing. failure per RG 1.53	N	N/A
3. Env. qual. per RG 1.89	Y	N/A
4. Power Source	Emerg Power	N/A
5. Out of Service interval	per tech spec	N/A
6. Portable	N	N/A
7. QA level	App B	N/A
8. Display type	OD	N/A
9. Display method	IND	N/A
10. Unique Identification	No	N/A
11. Periodic testing per RG 1.118	Y	N/A

III. Changes Required for Full Compliance, Cost, Schedule

Require installation of qualified, emergency power fed temperature sensor, transmitter, and indicator for the total service cooling water temperature (ie service water into ultimate heat sink) - Estimate cost and labor is $35,000.00.

IV. Comments

1. WNP-2 does monitor the RHR heat exchanger service water outlet. temperature on a recorder in the control room. It is not on emergency power, however, and the sensor is not environmentally qualified - other individual service water cooled items are individually monitored by local indicators and alarms.
2. Service water cooling flow and ultimate heat sinks temp provide the information needed (plus RHR heat exchanger service water outlet per #1 above).

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Service Cooling Water Flow

A. Range - 0-110% design
B. Type - D
C. Purpose - For indication of system operation

II. WNP-2 Design

A. Instrument Range - } No such instrument at WNP-2 [1]
B. WNP-2 Design }

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N/A
2. Sing. failure per RG 1.53	N	N/A
3. Env. qual. per RG 1.89	Y	N/A
4. Power Source	Emerg Power	N/A
5. Out of Service interval	per tech spec	N/A
6. Portable	N	N/A
7. QA level	App B	N/A
8. Display type	OD	N/A
9. Display method	IND	N/A
10. Unique Identification	No	N/A
11. Periodic testing per RG 1.118	Y	N/A

III. Changes Required for Full Compliance, Cost, Schedule

Install qualified flow transmitters at Indicators (or standby service cooling water flow at inlet to ultimate heat sink) Est. cost for procurement, labor and qualification is $40,000.00.

IV. Comments

1. WNP-2 has pressure monitors at pump discharge.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Flow in Ultimate Heat Sink Loop

A. Range - 0 to 110% design flow
B. Type - D
C. Purpose - For indication of system operation

II. WNP-2 Design

A. Instrument Range -
B. WNP-2 Design

} Flow in UHS loop is the same as service cooling water flow

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N/A
2. Sing. failure per RG 1.53	N	N/A
3. Env. qual. per RG 1.89	Y	N/A
4. Power Source	Emerg Power	N/A
5. Out of Service interval	per tech spec	N/A
6. Portable	N	N/A
7. QA level	App B	N/A
8. Display type	OD	N/A
9. Display method	IND	N/A
10. Unique Identification	No	N/A
11. Periodic testing per RG 1.118	Y	N/A

III. Changes Required for Full Compliance, Cost, Schedule

See Service Cooling Water Flow.

IV. Comments

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Temperature in Ultimate heat Sink Loop

A. Range - 30°F to 150°F
B. Type - D
C. Purpose - For indication of system operation

II. WNP-2 Design

A. Instrument Range - 0-150°F

B. WNP-2 Design - Two channels of indication per pond

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	Y	N
4. Power Source	Emerg power	UPS
5. Out of Service interval	per tech spec	per tech spec
6. Portable	N	N
7. QA level	App B	N
8. Display type	OD	cont
9. Display method	IND	IND
10. Unique Identification	No	N
11. Periodic testing per RG 1.118	Y	N(per tech spec)

III. Changes Required for Full Compliance, Cost, Schedule

Requires qualification of temperature sensors. Est$17,000 labor and construction for new sensors.

IV. Comments

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Ultimate Heat Sinks Level

A. Range - plant specific
B. Type - D
C. Purpose - To ensure adequate source of cooling water

II. WNP-2 Design

A. Instrument Range - 0-14'

B. WNP-2 Design - Two channels of indication per spray pond

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	Y	N
4. Power Source	Emerg power	UPS
5. Out of Service interval	per tech spec	per tech spec
6. Portable	N	N
7. QA level	App B	N
8. Display type	OD	cont
9. Display method	IND	IND
10. Unique Identification	No	N
11. Periodic testing per RG 1.118	Y	Y(per tech spec)

III. Changes Required for Full Compliance, Cost, Schedule

Requires qualification of detector. Estimated cost for qualification upgrade equals $78,000.00.

IV. Comments

Reg. Guide 1.97 - Table 3 Variables

I. Variable - SLCS Storage Tank Level

A. Range - Bottom to top
B. Type - E
C. Purpose - to provide indication of inventory for boron injection for shutdown.

II. WNP-2 Design

A. Instrument Range - 0-5000 gal.

B. WNP-2 Design - single tank level indicator in control room.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(qual. for cond of op.)	N
4. Power Source	Emerg power	N
5. Out of Service interval	N	N
6. Portable	N	N
7. QA level	App B	N
8. Display type	OD	C
9. Display method	IND	IND
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

Provide source of emergency power for instrument. Require qualification upgrade (assume QA documentation upgrade sufficient). Estimated cost for labor, materials, engineering, and upgrade is $10,000.00.

IV. Comments

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Sump Level in spaces of equipment required for safety

A. Range - to corresponding level of safety equipment failure
B. Type - D
C. Purpose - To monitor potential for failure of equipment in closed spaces due to flooding.

II. WNP-2 Design

A. Instrument Range - Non-analog alarm.

B. WNP-2 Design - Sump level alarms (non-class IE), high level alarm at floor level (Class IE)

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N/A(See Note 1)
2. Sing. failure per RG 1.53	N	N/A
3. Env. qual. per RG 1.89	Y	N/A
4. Power Source	Emerg power	N/A
5. Out of Service interval	per tech spec	N/A
6. Portable	N	N/A
7. QA level	App B	N/A
8. Display type	OD	N/A
9. Display method	IND	N/A
10. Unique Identification	No	N/A
11. Periodic testing per RG 1.118	Y	N/A

III. Changes Required for Full Compliance, Cost, Schedule

Addition of an emergency power, level indication system for each sump in the ECCS rooms (4 total). Estimated cost for new, qualified system is $97,000.00.

IV. Comments

1. The 4 ECCS room sumps at WNP-2 employ non-class IE alarm systems. If the sump overflows on to the floor, a class IE level sensor is actuated- an analysis has been performed that shows the operator has adequate time to isolate any leak source after the alarm before damage to any IE equipment.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - High radioactivity liquid tank level [3]

A. Range - top to bottom
B. Type - E
C. Purpose - available volume to store primary coolant.

II. WNP-2 Design

A. Instrument Range - top to bottom.

B. WNP-2 Design - level indication in the Radwaste Control Room.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(Qual for cond of op)	N
4. Power Source	Emerg power	N
5. Out of Service interval	N	N
6. Portable	N	N
7. QA level	App B [1]	N
8. Display type	OD	cont
9. Display method	IND	Rec
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

Require emergency power for indication and environmental qualifications and QA upgrade. Estimated cost for labor, materials, and qualification is $21,000.00. (Assume documentation upgrade only required.)

IV. Comments

1. 10CFR50, App B doesn't make sense for non-quality Class I system.
2. Emerg power doesn't make sense when Radwaste system does not have emerg power.
3. This item is under review as part of TMI lessons learned. Our judgement would indicate that we would not use these tanks for primary coolant after a large TMI like event without specific study of the condition at the time.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Charcoal Delay Gas System Gas flow or radioactivity level

A. Range - as required.
B. Type - E
C. Purpose - To monitor performances of system.

II. WNP-2 Design

A. Instrument Range - 10^1 - 10^6 cpm

B. WNP-2 Design - two post treatment off gas rad monitors.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(Qual for cond of op)	Y
4. Power Source	Emerg power	UPS
5. Out of Service interval	N	per tech spec
6. Portable.	N	N
7. QA level	App B 1	App B
8. Display type	OD	cont
9. Display method	IND	Rec
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	N	N9per tech spec)

III. Changes Required for Full Compliance, Cost, Schedule

None.

IV. Comments

1. It doesn't make sense to levy these requirements on a non-Quality Class I system.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Emergency Ventilation Damper Position

A. Range - Open-closed status
B. Type - D
C. Purpose - To ensure proper ventilation under accident conditions.

II. WNP-2 Design

A. Instrument Range - Full closed, Full open

B. WNP-2 Design - Open/closed indication on all dampers (reactor Bldg & Control Room).

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	Y
2. Sing. failure per RG 1.53	N	Y (1)
3. Env. qual. per RG 1.89	Y	Y (2)
4. Power Source	Emerg Power	Diesel
5. Out of Service interval	per tech spec	per tech spec
6. Portable	N	N
7. QA level	App B	App B
8. Display type	OD	Cont
9. Display method	IND	IND
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	Y	Y

III. Changes Required for Full Compliance, Cost, Schedule

Environmental Qualification review. Estimate for qualification upgrade is $78,000.00.

IV. Comments

1. One per damper, 2 dampers are in series to meet single failure.
2. Per 1971 criteria (under review), light bulbs are not qualified.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Temperature of space in vicinity of equipment required for safety

A. Range - 30°F to 130°F
B. Type - B (1)
C. Purpose - To monitor environmental conditions of equipment in closed spaces.

II. WNP-2 Design

A. Instrument Range - 50°F to 400°F (various ranges dependent on area)

B. WNP-2 Design - Redundant space temp monitors are provided. A single meter is provided with suitable inputs for each division.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	Y	Y
2. Sing. failure per RG 1.53	Y	Y (2)
3. Env. qual. per RG 1.89	Y	Y (2)
4. Power Source	CB	UPS
5. Out of Service interval	power 4.11,279-71	per tech spec
6. Portable	N	N
7. QA level	App B	App B
8. Display type	Con	Cont
9. Display method	Rec	IND
10. Unique Identification	Y	N
11. Periodic testing per RG 1.118	Y	Y

III. Changes Required for Full Compliance, Cost, Schedule

Replace meter module with qualified recorder, provide unique ID. Provide qualified sensors and indicators for critical meter control center and switchgear rooms in the Reactor Building. Estimated cost for materials, qualification upgrade, labor, and engineering is $415,000.00. GE estimates $210,000.00 and 12-18 months of schedule for its scope of supply.

IV. Comments

1. Is 'D' under Table 2 'PWR variables'. Recommend this be 'D' also.
2. Qualified per 1971 criteria (under review).

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Status of Class IE Power Supplies and Systems

A. Range - Voltages and Currents.
B. Type - D
C. Purpose - To ensure an adequate source of electric power for safety systems.

II. WNP-2 Design

A. Instrument Range - voltage, current

B. WNP-2 Design - Each safety related Buss is monitored for voltage or current, or both.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	Y (1)
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	Y	Y (1)
4. Power Source	Emerg power	UPS & Diesel
5. Out of Service interval	per tech spec	N
6. Portable	N	N
7. QA level	App B	N
8. Display type	OD	Cont
9. Display method	IND	IND
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	Y	Y

III. Changes Required for Full Compliance, Cost, Schedule

Upgrade qualification of readout devices. Assume QA documentation upgrade will be sufficient. Estimated cost is $6,000.00.

IV. Comments

1. Per 1971 criteria (under review), readout devices are qualified by type only.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Status of Non-Class IE Power Supplies

A. Range - Voltages and Currents.
B. Type - E
C. Purpose - To indicate adequate source of electric power.

II. WNP-2 Design

A. Instrument Range - Voltages, currents

B. WNP-2 Design - Each non-class IE Buss of 4KV or greater is monitored.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(qual for cond of op)	N
4. Power Source	Emerg power (1)	N
5. Out of Service interval	N	N
6. Portable	N	N
7. QA level	App B (2)	N
8. Display type	OD	cont
9. Display method	IND	IND
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

Provide special Buss monitoring indicators.[1] Assume only action will be to upgrade QA documentation. Estimated cost equals $6,000.00.

IV. Comments

1. This doesn't make sense since instruments are powered from Buss.
2. App B doesn't apply for Non-quality Class I equipment.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Radiation Exposure Rates

A. Range - 10^1 to 10^4 R/hr for photons. (1) (3)
B. Type - E
C. Purpose - For measurement of high-range radiation exposure rates at various locations.

II. WNP-2 Design

A. Instrument Range - 10^{-3} to 10 R/hr (some higher dependent on area)

B. WNP-2 Design - Area monitors throughout buildings (4)

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(qual for cond of op)	N (2)
4. Power Source	Emerg power(5)	N
5. Out of Service interval	N	N
6. Portable	N	Y
7. QA level	App B (6)	N
8. Display type	OD	cont
9. Display method	IND	Rec I
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

Require addition of approximately 6 high range monitor. Upgrade QA qualification, provide emergency power. Total estimated cost for labor, material, and QA equals $146,000.00.

IV. Comments

1. It doesn't make sense to be prescriptive on range here. It should be dependent on maximum possible dose rate for the area monitored.
2. Specified for environment in which monitor is located
3. Calibration above 10^2 R/hr is virtually impossible.
4. Backup provided by portable instruments
5. Emergency power shouldn't be required where backup can be provided by portable instruments.
6. 10CFR50, App. B doesn't make sense for non Quality Class I instruments.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Effluent radioactivity - Noble gases-containment exhaust vent and SBGTS vent

A. Range - 10^{-7} to 10^{5} μCi/cc xe 133
B. Type - E
C. Purpose - ANS - 4.5, sect. 6.2.6 to provide operator with information regarding release of radioactive noble gases on a continuous basis

II. WNP-2 Design

A. Instrument Range - low range 10^{-7} to 3 X 10^{-2} μCi/cc (xe 133) (2)
high range 2 X 10^{-2} to 2 X 10^{4} μCi/cc (xe 133)
B. WNP-2 Design - Two channels for high range elevated release

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(qual for cond of op)	N
4. Power Source	Emerg power	UPS
5. Out of Service interval	N	per tech spec
6. Portable	N	N
7. QA level	App B (1)	N
8. Display type	OD	cont
9. Display method	IND	Rec
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

Reposition one of the high range detectors to increase range to 10^{5} μCi/cc upgrade qualification records. Estimated cost for labor, materials, engineering, and QA equals $18,000.00.

IV. Comments

1. 10 CFR 50, App B doesn't make sense for non-Qual Class I instruments.
2. WPPSS feels that 2 X 10^{4} μCi/cc is sufficient upper range for the BWR 5/MKII containment/Reactor Bldg, configuration.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Effluent radioactivity - Noble gases - other points

A. Range - 10^{-7} to 10^{2} μCi/cc (xe 133) (2)
B. Type - E
C. Purpose - ANS-4.5, Section 6.2.6

II. WNP-2 Design

A. Instrument Range - 10^{-7} to B X 10^{-2} μCi/cc (xe 133)

B. WNP-2 Design - Monitors on Turbine Bldg and Radwaste Bldg Exhaust Duct

	Design Criteria	Required by Reg Guide	WNP-2 Compliance
1.	Seis. qual. per RG 1.100	N	N
2.	Sing. failure per RG 1.53	N	N
3.	Env. qual. per RG 1.89	N(qual to cond of op)	N
4.	Power Source	Emerg power	UPS
5.	Out of Service interval	N	N
6.	Portable	N	N
7.	QA level	App B (1)	N
8.	Display type	OD	cont
9.	Display method	IND	Rec
10.	Unique Identification	N	N
11.	Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

Add additional detectors (2-one for each location). High range detectors can be placed on the duct or added to the present off line gas monitors to gain the extended range. Estimated cost for labor, material, engineering, and QA equals $54,000.00.

IV. Comments

(1) 10CFR50 APP B DOESN'T MAKE SENSE FOR NON SAFTY CLASS I INSTRUMENTS
(2) range should not be prescribed.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Effluent radioactivity - high range radiohalogens and Particulates

A. Range - 10^{-3} to 10^{2} μCi/cc
B. Type - E
C. Purpose - to provide the operator with information regarding release of radioactive halogens and particulates.

II. WNP-2 Design

A. Instrument Range - N/A (2)

B. WNP-2 Design - 3 effluent monitors - particulate and iodine filters can be removed for lab analysis

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N/A
2. Sing. failure per RG 1.53	N	N/A
3. Env. qual. per RG 1.89	N(Qual for cond of op)	N/A
4. Power Source	Emerg power	N/A
5. Out of Service interval	N	N/A
6. Portable	N	N/A
7. QA level	App B (1)	N/A
8. Display type	OD	N/A
9. Display method	IND	N/A
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

For effective on live monitoring; 3 new particulate monitors would be required downstream of filter systems on the exhaust streams. Estimated cost for labor, material, engineering, and QA equals $424,000.00.

IV. Comments

1. 10CFR50 App B doesn't make sense for non-quality Class I systems.
2. In plant particulate monitors upstream of filters monitor exhaust stream air to high sensitivities. Since Turbine building employs no filters, these units monitor particulate environmental release at low levels.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Environs radioactivity - Exposure rate

A. Range - 10^{-6} to 10^{2} R/hr
B. Type - E
C. Purpose - For estimating release rates during an accident from unidentified release paths (not covered by affluent monitors)

II. WNP-2 Design

A. Instrument Range - 10^{-6} to 10^{-2} R/hr(2)

B. WNP-2 Design - 9 ion chambers for WNP-1,2, & 4. Only one powered from WNP-2.

	Design Criteria	Required by Reg Guide	WNP-2 Compliance
1.	Seis. qual. per RG 1.100	N	N'
2.	Sing. failure per RG 1.53	N	N
3.	Env. qual. per RG 1.89	N(Qual for cond of op)	N
4.	Power Source	Emerg power	N
5.	Out of Service interval	N	N
6.	Portable	N	N
7.	QA level	App B (1)	N
8.	Display type	OD	cont
9.	Display method	IND	IND
10.	Unique Identification	N	N
11.	Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

BWR 5/MK II Design satisfies intent (see note 2). If not, add 20 units around site environs. The cost is not estimated. The instruments above to cover 20 locations for the range requested would be $400,000.00. To this would be the cost of small shacks with air conditioning, heating, cabling, labor, etc. The cost would easily go over $1 million (or a small return of benefit).

IV. Comments

1. 10CFR50 App B doesn't make sense (or non-quality Class 1 systems)
2. BWR-5MKII's cover all effluent release paths with monitors due to primary containment being located entirely within a secondary containment and effluent monitors on all release points (secondary containment, Reactor Building, Turbine Building, Radwaste Building).
3. Emerg power should not be required where portable instruments can provide satisfactory back up.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Environs radioactivity-Radiohalogens and Particulates

A. Range - 10^{9} to 10^{3} μCi/cc
B. Type - E
C. Purpose - For estimating release rates of radioactive materials released during an accident from unidentified release paths (not covered by effluent monitors).

II. WNP-2 Design

A. Instrument Range - N/A (analysis)

B. WNP-2 Design - One sampler located at the same location as the 9 ion chambers. Samples must be removed for analysis.

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(qual cond of op)	N
4. Power Source	Emerg power	N
5. Out of Service interval	N	N
6. Portable	N	N
7. QA level	App B (1)	N
8. Display type	OD	cont
9. Display method	IND	Sample
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

BWR 5/MK II Design satisfies intent (see Note 2). If not, add 20 samplers around site environs. See the comments on the previous page for cost. The cost for 20 samplers above would be $80,000.00.

IV. Comments

1. 10 CFR 50, App B doesn't make sense for non-quality Class I systems.
2. See Note (2) on previous page.
3. Emerg. power should not be required where portable instruments can provide satisfactory back up.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Plant and Environs Readioactivity (portable instruments)

A. Range - High Range-0.1 to 10^4 R/M, 0.1 to 10^4 rads/M b and low energy
B. Type - E
C. Purpose - During and following accident, to mointor activity throughout facility where stationary monitors are inpractical.

II. WNP-2 Design

A. Instrument Range -
B. WNP-2 Design

} Portable instruments and a multi-channel analyzer will be available at WNP-2

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(qual for cond of op)	N
4. Power Source	N/A	N/A
5. Out of Service interval	N	N
6. Portable	Y	Y
7. QA level	App B (1)	N
8. Display type	N/A	N/A
9. Display method	N/A	N/A
10. Unique Identification	N/A	N/A
11. Periodic testing per RG 1.118	N/A	N/A

III. Changes Required for Full Compliance, Cost, Schedule

None.

IV. Comments

1. 10 CFR 50, App B doesn't have meaning for portable instruments.
2. Portable instruments reading >1000 R/M are not practical considering human exposure.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Post Accident Sampling Capability

A. Range - As required based on Reg-Guide 1-3 guidelines (x-ray spectrum, PH,H2 02)
B. Type - E
C. Purpose - ANS-4.5, Section 6.3.2. to provide means for safe and convenient sampling. These provisions should include shielding (ALARA), sampling containers compatible w/ sampling ports, capability to sample under pos & neg pressure handling and transport capability, pre-arrangement for analysis & interpretation.

II. WNP-2 Design

A. Instrument Range - Sampling is provided on containment air effluent vents, and primary coolant
B. WNP-2 Design

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	See Note 1
2. Sing. failure per RG 1.53	N	See Note 1
3. Env. qual. per RG 1.89	N(qual for cond of op)	See Note 1
4. Power Source	Emerg power	See Note 1
5. Out of Service interval	N	See Note 1
6. Portable	N	See Note 1
7. QA level	App B	See Note 1
8. Display type	N/A	See Note 1
9. Display method	N/A	See Note 1
10. Unique Identification	N/A	See Note 1
11. Periodic testing per RG 1.118	N/A	See Note 1

III. Changes Required for Full Compliance, Cost, Schedule

Add containment penetrations, add additional coolant and suppression pool sample lines, shield sample lines, provide special radiological analysis lab. Provide emergency power for sampling capability. Estimated cost (in connection with TMI lessons learned) for engineering, materials, labor, and QA is $2.5 million.

IV. Comments

1. This item is under review in connection with TMI 2 lessons learned in response to NUREG 0578. NRC position should be compatible with 0578.

Reg. Guide 1.97 - Table 3 Variables

I. Variable - Meteorology Wind Direction, Wind Speed, Temperature, Vertical Temperature Diff, Precipitation

A. Range - 0-300°, 0-30 mps-60°F to 120°F, -9°F to 9°F, recording rain guage
B. Type - E
C. Purpose - For determining weather conditions.

II. WNP-2 Design

A. Instrument Range - 0-540°, 0.6-60 mph, -30°F to 130°F, -10°F to 10°F, recording rain guage

B. WNP-2 Design - Recorders for all measurements in Met Tower Shack readouts in control room (recorders) provided for all measurements except precip (3)

Design Criteria	Required by Reg Guide	WNP-2 Compliance
1. Seis. qual. per RG 1.100	N	N
2. Sing. failure per RG 1.53	N	N
3. Env. qual. per RG 1.89	N(qual for cond of op)	N
4. Power Source	Emerg power (2)	N
5. Out of Service interval	N	N
6. Portable	N	N
7. QA level	App B (1)	N
8. Display type	OD	cont
9. Display method	IND	Rec
10. Unique Identification	N	N
11. Periodic testing per RG 1.118	N	N

III. Changes Required for Full Compliance, Cost, Schedule

Provide emergency power for MULTIPLEXERS IN REACTOR BLDG. This requires new multiplexer cabinets. Estimated total cost for engineering, labor, and QA is $162,000.00.

IV. Comments

1. 10 CFR 50, App B doesn't make sense for non-Quality Class I instruments.
2. Emerg power shouldn't be required if appropriate back-ups are available on the Hanford reservation, DOE maintains a Met Tower.
3. WNP-2 is located in the desert, so control room precip recording is not considered appropriate.

Attachment III

MARK-UP OF REG. GUIDE 1.97*

*Table 2 not included.

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF STANDARDS DEVELOPMENT
DRAFT REGULATORY GUIDE AND VALUE/IMPACT STATEMENT

December 1979
Division 1
Task RS 917-4

Contact: A. S. Hintze, (301) 443-5913

PROPOSED REVISION 2* TO REGULATORY GUIDE 1.97

INSTRUMENTATION FOR LIGHT-WATER-COOLED NUCLEAR POWER PLANTS TO ASSESS PLANT AND ENVIRONS CONDITIONS DURING AND FOLLOWING AN ACCIDENT

A. INTRODUCTION

Criterion 13, "Instrumentation and Control," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," includes a requirement that instrumentation be provided to monitor variables and systems for accident conditions as appropriate to ensure adequate safety.

Criterion 19, "Control Room," of Appendix A to 10 CFR Part 50 includes a requirement that a control room be provided from which actions can be taken to maintain the nuclear power unit in a safe condition under accident conditions, including loss-of-coolant accidents, and that equipment, including the necessary instrumentation, at appropriate locations outside the control room be provided with a design capability for prompt hot shutdown of the reactor.

Criterion 64, "Monitoring Radioactivity Releases," of Appendix A to 10 CFR Part 50 includes a requirement that means be provided for monitoring the reactor containment atmosphere, spaces containing components for recirculation of loss-of-coolant accident fluid, effluent discharge paths, and the plant environs for radioactivity that may be released from postulated accidents.

This guide describes a method acceptable to the NRC staff for complying with the Commission's regulations to provide instrumentation to monitor plant variables and systems during and following an accident in a light-water-cooled nuclear power plant.

*The substantial number of changes in this proposed revision has made it impractical to indicate the changes with lines in the margin.

B. DISCUSSION

Indications of plant variables and status of systems important to safety are required by the plant operator (licensee) during accident situations to (1) provide information required to permit the operator to take preplanned manual actions to accomplish safe plant shutdown; (2) determine whether the reactor trip, engineered-safety-feature systems, and manually initiated systems are performing their intended functions (i.e., reactivity control, core cooling, maintaining reactor coolant system integrity, and maintaining containment integrity); (3) provide information to the operator that will enable him to determine the potential for causing a breach of the barriers to radioactivity release (i.e., fuel cladding, reactor coolant pressure boundary, and containment) and if a barrier has been breached; (4) furnish data for deciding on the need to take unplanned action if an automatic or manually initiated safety system is not functioning properly or the plant is not responding properly to the safety systems in operation; and (5) allow for early indication of the need to initiate action necessary to protect the public and for an estimate of the magnitude of the impending threat.

At the start of an accident, it may be difficult for the operator to determine immediately what accident has occurred or is occurring and, therefore, to determine the appropriate response. For this reason, reactor trip and certain other safety actions (e.g., emergency core cooling actuation, containment isolation, or depressurization) have been designed to be performed automatically during the initial stages of an accident. Instrumentation is also provided to indicate information about plant parameters required to enable the operation of manually initiated safety systems and other appropriate operator actions involving systems important to safety.

Instrumentation is also needed to provide information about some plant parameters that will alert the operator to conditions that have degraded beyond those postulated in the accident analysis. In particular, it is important that the operator be informed regarding that status of coolant level in the reactor vessel or the existence of core voiding that would indicate degraded core cooling. ~~Direct indication of coolant level in the reactor vessel is not currently available in pressurized water reactors. However, it is imperative that this capability be developed within a reasonable time in order to provide the operator with this vital information in a positive, unambiguous manner.~~ It is essential that degraded conditions be identified so that the operator can take

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actions that are available to mitigate the consequences. It is not intended that the operator be encouraged to prematurely circumvent systems important to safety but that he be adequately informed in order that unplanned actions can be taken when necessary.

Examples of serious events that could threaten safety ~~if conditions degrade beyond those assumed in the Final Safety Analysis Report~~ are loss-of-coolant accidents (LOCAs), overpressure transients, anticipated transients without scram (ATWS), reactivity excursions, and releases of radioactive materials. Such events require that the operator understand, within a short time period, the ability of the barriers to limit radioactivity release, i.e., the potential for breach of a barrier, or an actual breach of a barrier by an accident in progress.

It is essential that the required instrumentation be capable of surviving the accident environment in which it is located for the length of time its function is required ~~as defined by Section 3.0 of Draft Standard ANS-4.5,* "Functional Requirements for Accident Monitoring in a Nuclear Power Generating Station," Draft 4 dated November 1979~~. It could therefore either be designed to withstand the accident environment or be protected by a local protected environment. If the environment surrounding an instrument component is the same for accident and normal operating conditions (e.g., some instrumentation components outside of containment or those in the main control room powered by a Class 1E source), the instrumentation components need no special environmental qualification.

~~It is important that accident-monitoring instrumentation components and their mounts that cannot be located in other than non-Seismic Category I buildings be conservatively designed for the intended service.~~

Parameters selected for accident monitoring can be selected so as to permit relatively few instruments to provide the essential information needed by the operator for postaccident monitoring. Further, it is prudent that a limited

*Copies may be obtained from the American Nuclear Society, ~~555 North Kensington~~ Avenue, La Grange Park, Illinois 60525. Although this standard has been balloted by the responsible subcommittee and reviewed by the responsible consensus body, Draft 4 does not reflect the resolution of all comments. A subsequent draft is intended to address the comments that formed the basis of the negative subcommittee ballots.

move to next page

number of those parameters which are fundamentally significant (e.g., containment pressure, primary system pressure) be monitored by instruments qualified to more stringent environmental requirements and with ranges that extend well beyond that which the selected parameters can attain under limiting conditions. It is essential that the range selections not be arbitrary but sufficiently high that the instruments will always be on scale; for example, a range for the containment ~~pressure~~ radiation monitor extending ~~beyond the levels estimated in a LOCA to the burst pressure of the containment~~ in order that the operator will not be blind as to ~~the level of containment pressure~~ containment radiation levels. Provisions of such instruments are important so that responses to corrective actions can be observed and the need for, and magnitude of, further actions determined. On the other hand, it is also necessary to make sure that when a range is extended, the sensitivity and accuracy of the instrument are within acceptable limits.

Containment Pressure is a bad and controversial example

Normal power plant instrumentation remaining functional for all accident conditions can provide indication, records, and (with certain types of instruments) time-history responses for many parameters important to following the course of the accident. Therefore, it is prudent to select the required accident-monitoring instrumentation from the normal power plant instrumentation to enable the operator to use, during accident situations, instruments with which he is most familiar. Since some accidents impose severe operating requirements on instrumentation components, it may be necessary to upgrade those instrumentation components to withstand the more severe operating conditions and to measure greater variations of monitored variables that may be associated with the accident if they are to be used for both accident and normal operation. However, it is essential that instrumentation so upgraded does not compromise the accuracy and sensitivity required for normal operation. In some cases, this will necessitate use of overlapping ranges of instruments to monitor the required range of the parameter to be monitored.

Draft Standard ANS-4.5, Draft 4 dated November 1979*, delineates criteria for determining the variables to be monitored by the control room operator, as required for safety, during the course of an accident and during the long-term stable shutdown phase followng an accident. Draft Standard ANS-4.5 was prepared by Working Group 4.5 of subcommittee ANS-4 with two primary objectives: (1) to address that instrumentation that permits the operator to monitor expected parameter changes in an accident period and (2) to address extended range instrumentation deemed appropriate for the possibility of encountering previously unforeseen events.

* [From previous page]

The standard defines four classifications of variable types for the purpose of aiding the designer in his selection of accident-monitoring instrumentation and applicable criteria. ~~(A fifth type [Type E] has been added by this regulatory guide.)~~ The types are: (1) Type A - those variables that provide information needed for preplanned operator actions, (2) Type B - those variables that provide information to indicate whether plant safety functions are being accomplished, (3) Type C - those variables that provide information to indicate the potential for being breached or the actual breach of the barriers to fission product release, i.e., fuel cladding, primary coolant pressure boundary, and containment, (4) Type D - those variables that provide information to indicate the performance of individual safety systems, ~~and~~ (5) Type E - those variables to be monitored as required for use in determining the magnitude of the release of radioactive materials and for continuously assessing such releases, for providing defense in depth, and for diagnosis. Type A variables have not been included in the listings of variables to be measured because they are plant specific and will depend on the operations that the designer chooses for preplanned manual action. The five classifications are not mutually exclusive in that a given variable (or instrument) may be included in one or more types, as well as for normal powerplant operation or for automatically initiated safety actions. Where such multiple listing or use occurs, it is essential that instrumentation be capable of meeting the most stringent requirements.

A fifth type, Type E, is added by this Regulatory Guide.

The time phases (Phases I, II, and III) delineated in ANS-4.5 are not specified for each variable in this regulatory guide. These considerations are plant specific. It is important that the required instrumentation survive the accident environment and function as long as the information it provides is needed by the plant operator.

C. REGULATORY POSITION

The criteria, requirements, and recommendations (identified as important to safety) contained in Draft Standard ANS-4.5, "Functional Requirements for Accident Monitoring in a Nuclear Power Generating Station," Draft 4 dated November 1979, are considered by the NRC staff to be generally acceptable for providing instrumentation to monitor variables and systems for post-accident conditions. ~~and for monitoring the reactor containment, spaces containing components for recirculation of loss-of-coolant accident fluids, effluent discharge~~

~~paths, and the plant environs for radioactivity that may be released during and following an accident from a nuclear power plant subject to the following.~~

1. Section 2.0 of ANS-4.5 defines the scope of the standard as containing criteria for determining the variables to be monitored by the control room operator during and following an accident that will need some operator action. Consideration should be given to the additional requirements (e.g., emergency planning) of variables to be monitored by the plant operator (licensee) during and following an accident. Instrumentation selected for use by the plant operator for monitoring conditions of the plant is useful in an emergency situation and for other purposes and therefore should be factored into the emergency plans action level criteria.

2. In Section 3.0 of ANS-4.5, the definition of "Type C" includes two items, (1) and (2). Item (1) includes those instruments that indicate the extent to which parameters that indicate the potential for a breach in the containment have exceeded the design basis values. In conjunction with the parameters that indicate the potential for a breach in the containment, the parameters that have the potential for causing a breach in the fuel cladding (e.g., core exit temperature) and the reactor coolant pressure boundary (e.g., reactor coolant pressure) should also be included. References to Type C instruments, and associated parameters to be measured, in Draft Standard ANS-4.5 (e.g., Sections 4.2, 5.0, 5.1.3, 5.2, 6.1, 6.3) should include this expanded definition.

~~3. Section 3.0 of ANS-4.5 defines design basis accident events. In conjunction with the design basis accident events delineated in the standard, those events that are expected to occur one or more times during the life of a nuclear power unit and include but are not limited to loss of power to all recirculating pumps, tripping of the turbine generator set, isolation of the main condenser, and loss of all offsite power should be included.~~

Delete - Not well thought out - Don't see the point of what this adds -

3. ~~A.~~ Section 4.2 of ANS-4.5 discusses the various types of variables. ~~With regard to the discussion of Type D variables, Type D variables and instruments are within the scope of Accident Monitoring Instrumentation although they are not addressed in Draft Standard ANS-4.5.~~ They are, however, along with those of an additional type, Type E, included in this regulatory guide. (See Tables 1, 2, and 3.)

Upgrade of Type D not justified

4. ~~B.~~ Section 6.1 of ANS-4.5 pertains to General Design Criteria for instrumentation monitoring Types A, B, and C variables. In conjunction with Section 6.1,

instrumentation monitoring Types D and E variables should also be included. Revised applicable design criteria are identified in Table 1 of this regulatory guide.

→ Delete – arbitrary criteria

6. Section 6.1.2 of ANS-4.5 pertains to the duration that instrumentation is qualified to function. In conjunction with Section 6.1.2, Phase II instrumentation should be qualified to function for not less than 200 days unless a shorter time, based on need or component accessability for replacement or repair, can be justified.

7. Sections 6.2.2, 6.2.3, 6.2.4, 6.2.5, 6.2.6, 6.3.2, 6.3.3, 6.3.4, and 6.3.5 of ANS-4.5 pertain to variables and variable ranges for monitoring. In conjunction with the above sections, Tables 1, 2, and 3 of this regulatory guide (which include those parameters mentioned in the above sections) should be used in developing the minimum set of instruments and their respective ranges for accident-monitoring instrumentation for each nuclear power plant.

8. Section 6.4 of ANS-4.5 pertains to specific design criteria for accident-monitoring instrumentation. In conjunction with Section 6.4, the provisions as indicated in Table 1 of this regulatory guide should be used.

→ Delete – Table already is appropriately referenced. Deviations from ANS 4-5 should be justified.

D. IMPLEMENTATION

This proposed revision has been released to encourage public participation in its development. Except in those cases in which an applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method to be described in the active guide reflecting public comments will be used in the evaluation of the following applications that are docketed after the implementation date to be specified in the guide:

1. Preliminary Design Approval (PDA) applications and Preliminary Duplicate Design Approval (PDDA) applications.
2. Final Design Approval, Type 2 (FDA-2), applications and Final Duplicate Design Approval, Type 2 (FDDA-2), applications.
3. Manufacturing License (ML) applications.
4. Construction Permit (CP) applications except for those portions of CP applications that reference standard designs (i.e., PDA, FDA-1, FDA-2, PDDA, FDDA-1, FDDA-2, or ML) or that reference qualified base plant designs under the replication option.

In addition, the NRC staff intends to implement part or all of this guide for all operating plants, plants under construction, all PDAs and FDAs, all PDDAs and all FDDAs that may involve additions, elimination, or modification of structures, systems, or components of the facility after the construction permit or design approval has been issued. All backfitting decisions in accordance with the positions stated in this guide will be determined by the staff on a case-by-case basis.

The implementation date of this guide will in no case be earlier than April 15, 1980.

Table 1

DESIGN CRITERIA[1]

CRITERIA	INSTRUMENTATION TYPES[2] A	B	C	D	E
1. Seismic qualification per Regulatory Guide 1.100	yes	yes	~~yes~~ NO[3]	no[3]	no[3]
2. Single failure criteria per Regulatory Guide 1.53	yes[21]	yes[21]	~~yes~~ NO	no	no
3. Environmental qualification per Regulatory Guide 1.89	yes	yes	yes[4]	~~yes~~ NO	no[8]
4. Power source	Emr[6]	CB[7]	CB[7]	~~Emr[6]~~ NO	~~Emr[6]~~ NO
5. Out-of-service interval before accident	8	8	8	9	10
6. Portable	no	no	~~no~~[11]	~~no~~[21]	no[11]
7. Quality assurance level	12	12	12	1 NO	1 NO
8. Display type[13]	Con[14]	Con[14]	Con[14]	OD[15]	OD[15]
9. Display method	Rec[16,17]	Rec[17,16]	Rec[17,16]	Ind[18,19]	Ind[18,19]
10. Unique identification	yes	yes	yes	no	no
11. Periodic testing per Regulatory Guide 1.118	yes	yes	yes	~~yes~~ NO	no[20]

Delete -

[1]Unless different specifications are given in this regulatory guide, the specifications in ANSI N320-1979, "Performance Specifications for Reactor Emergency Radiological Monitoring Instrumentation," apply to the high-range containment area monitors, area exposure rate monitors in other buildings, effluent and environmental monitors, and portable instruments for measuring radiation or radioactivity.

[2]Type A - Those instruments that provide information required to take preplanned manual actions.

Type B - Those instruments that provide information to monitor the process of accomplishing critical safety functions.

Type C - Those instruments that indicate the potential for breaching or the the actual breach of the barriers to fission product release.

Type D - Those instruments that indicate the performance of individual safety systems.

Type E - Those instruments that provide information for use in determining the magnitude of the release of radioactive materials and for continuously assessing such releases, for defense in depth, and for diagnosis.

[3]Radiation monitors should meet the requirements of ANSI N320-1979, Section 5.14 and/or Section 9.1.15, as appropriate.

[4]See paragraph 6.3.6 of Draft Standard ANS-4.5.

(Footnotes continued)

Footnotes continued for Table 1

~~[6]Qualified to the conditi[illegible] of its operation and, for ra[illegible]ation monitors, ANSI N320-1979.~~ Doesn't say anything. This is understood in equipment specs.

[6]Emergency power source.

[7]Critical Instrument Bus - Class 1E Power. } These two need clarification (DIESEL, UNINTERRUPTIBLE POWER?)

[8]Paragraph 4.11, "Exemption," of IEEE Standard 279-1971.

[9]Based on normal Technical Specification requirements on out-of-service for the safety system it serves.

[10]Not necessary to include in the Technical Specifications unless specified by other requirements.

[11]Radiation monitoring outside containment may be portable if so designated in Tables 2 and 3.

[12]Level of quality assurance per Appendix B to 10 CFR Part 50.

[13]Continuous indication or recording displays a given variable at all times; intermittent indication or recording displays a given variable periodically; on-demand indication or recording displays a given variable only when requested.

[14]Continuous display.

[15]Indication on demand. (or continuous)

[16]Where trend or transient information is essential to planned operator actions.

[17]Recording.

[18]Dial or digital indication. (or recorder)

[19]Effluent release monitors require recording, including effluent radioactivity monitors, environs exposure rate monitors, and meteorology monitors.

[20]Radiation monitors should be periodically tested in accordance with the requirements of ANSI N320-1979.

21 Unless adequate diversity can be shown by another variable similarly qualified.

For specific comments see Attachment 2. This table should be merely examples. It should be up to the designer to document compliance as appropriate to criteria.

Table 3

Examples of BWR VARIABLES

Measured Variable	Range	Type	Purpose
CORE			
Core Exit Temperature	150°F to 2300°F	B,C	To provide incore temperature measurements to identify localized hot areas. (Approximately 50 measurements)
Control Rod Position	Full in or not full in	D	To provide position indication that the control rods are fully inserted. (Minimum of 2 hours after accident)
Neutron Flux	1 c/s to 1% power (at least one fission counter)	B	ANS-4.5, Section 6.2.2. For indication of approach to criticality.
REACTOR COOLANT SYSTEM			
RCS Pressure	15 psia to 2000 psig	B,C	ANS-4.5, Sections 6.2.3, 6.2.4, 6.3.3, and 6.3.5. For indication of an accident and to indicate that actions must be taken to mitigate an event.
Coolant Level in the Reactor	Bottom of core support plate to above top of discharge plenum	B	ANS-4.5, Section 6.2.3. For indication of fuel submergency for a LOCA event.
Main Steamline Flow	0 to 120% design flow[1]	B	To provide an indication of the integrity of the pressure boundary.
Main Steamline Isolation Valves' Leakage Control System Pressure	0 to 15" of water 0 to 5 psid	B	To provide an indication of the pressure boundary and containment
Primary System Safety Relief Valve Positions, including RCS or Flow Through or Pressure in Valve Vents	Closed-not closed or 0 to 50 psig	B,D	By these measurements, the operator knows if there is a path open for loss of coolant and if an event may be in progress.

[1] Design flow - the maximum flow anticipated in normal operation.