PACIFIC GAS AND ELECTRIC COMPANY

PG&E

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January 21, 1980

DOCKET NUMBER
PROPOSED RULE PR- Misc Notice Reg. Guide

Secretary of the Commission
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

JAN 25 1980
Office of the Secretary
Docketing & Service
Branch

Attention: Docketing and Services Branch

Re: Docket No. 50-275
Docket No. 50-323
Diablo Canyon Units 1 & 2

Dear Sir:

Attached for your review and information are our comments to the proposed revision 2 to Regulatory Guide 1.97. Attachment A represents our general comments without regard to specific plant applicability, while Attachment B addresses the feasibility of designing and installing instruments meeting the proposed requirements at Diablo Canyon. The Attachment B comments were solicited by Mr. Victor Benaroya at the December 13 meeting with representatives of several utilities and the NRC Staff.

Very truly yours,

Philip A. Crane, Jr.

Attachments

Acknowledged by card 1/25 gf

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ATTACHMENT A

COMMENTS ON REGULATORY GUIDE 1.97

REVISION 2

BY

PACIFIC GAS AND ELECTRIC COMPANY

These comments apply to the Regulatory Guide as written without regard to specific plant applicability. Comments on the feasibility of implementation at Diablo Canyon were submitted separately. The attached mark up of the standard has our comment numbers in the margin.

1. Our first comment deals with the format of the Regulatory Guide. As written, it is extremely difficulty to read and understand. We are aware of the circumstances which led to the Reg. Guide having a different scope than ANS 4.5. We think that this is unfortunate, and we feel that the Reg. Guide should either adopt the same scope as the standard (with possibly a separate Reg. Guide for instruments not within that scope) or else stand on its own.

2. Regulatory Position C.3 expands the definition of design basis accident events. Much confusion has been needlessly generated in this industry simply because the terminology is not consistent. While it is prudent to provide instrumentation for operational transients and faults of moderate frequency, it is not prudent to force fit them into existing definitions. Both the Reg. Guide and the Standard have attempted to redefine design basis accident; we do not believe this should be done. The definition should be deleted; the scope does not depend on it.

3. Regulatory Position C.6 appears to be arbitrary. We realize that within the definition of Phase II, many instruments within the TMI-2 containment are still working and many are still required, but the atmosphere is no longer abnormal. If an instrument is now working there, it would not be expected to fail now as a result of a previously adverse environment. The hardship that would be imposed on industry by upping the post-accident duration does not appear to be justified in view of the benefit that could be gained. We do not believe that single new failure would be found if every device was retested for a 200 day post-accident duration.

4. Due to the various implementations of criteria in various plants, we believe that the requirements indicated for Table 1 Items 1, 2, 3, and 11 should be "per licensing committments" or some such statement rather than "per regulatory guide xxx"

5. Table 1 criteria 8 and 9 deal with the display. The requirement for continuous recording is too restrictive and does not take into consideration the purpose of the display. The requirement that the display be continuous is a valid one as it stands on its own. It does, however, rule out all printing recorders used for multipoint recording (over 3 points). The devices print at an interval equal to the cycle time between points. The other half of the problem is the requirement to record everything. Indeed, many parameters should be recorded, but some needn't be. Recorders waste valuable control board space and spread the operator's field of attention over a large area to view a small number of parameters. We feel that flexibility of the type given in note 16 is appropriate. We think that continuous records are required when the transient response is such that useful information is lost by intermittant recording (e.g., containment pressure). Intermittant records should be allowed if the transient response time is greater than the recording interval (e.g., incore thermocouples). Some parameters would be farcical to record (e.g., valve position). Others would provide no additional information if recorded (e.g., reactor coolant flow). Recording should be required when trend information can be useful in monitoring the accident. We suggest the following changes to Notes 14 and 17.

   14. Continuous Display. Intermittant displays such as data loggers and scanning recorders may be used for multipoint parameters if no significant transient response can occur inside the recording interval.

   17. Recording for those parameters where trend or historical information is required to monitor the function.

6. On Table 2, the neutron flux fission counter should be deleted since any fission counter which can monitor this low range cannot survive normal operation.

7. Reactor coolant flow may be used to monitor a critical safety functions' accomplishment, but it doesn't monitor the function of any safety system. Therefore, Type D should be deleted.

8. This comment mirrors a concern aluded to in Comment 7. It is important to properly define what it is that we are indicating. We think that it is important to differentiate between safety functions and safety systems. The indication of these valve positions indicates the completion of a safety function - containment isolation. The system which causes this to occur is not being monitored at all. Hence Type D should be deleted.

9. The purpose for containment sump water level indicates that this instrument indicates a breach (Type C), and an inventory control (Type A). No Type B purpose is given. (We are not indicating Type A functions on this guide because that is plant specific.)

10. We question the purpose of main feedwater flow as a PAM function. We know of no accident scenario where main feedwater is supplied to the steam generator; indeed it is isolated out on anything other than a simple reactor trip.

11. We do not feel that safety valve position is a safety system function.

12. We agree that it is necessary to monitor condensate storage tank level to assure an adequate water supply. This monitors the performance (capability) of a safety system. We do not feel that it monitors the response of the plant or the potential for breach of a release barrier.

13. We feel that monitoring of sump levels and space temperatures which are not actually used by the safety systems are only valid for defense in depth.

14. A number of functions or capabilities are listed which are not what is normally considered to be plant instruments but rather sampling and laboratory capabilities. While we do not question the need to have these capabilities, we do question them in this regulatory guide. We feel that permanent plant instrumentation and laboratory equipment and capabilities should be well separated.

15. Table 2 also contained meteorological instrumentation. Reg. Guide 1.23 defines these requirements. Rather than provide detailed information here that may conflict with future revisions of Reg. Guide 1.23, a simple reference should be used.

We did not review Table 3, since it is not applicable to our current endeavors.

4th TD - 11/28/79

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

PG&E COMMENTS
(NO COMMENTS ON PAGES 1→5)

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.

PG 7 E #2 COMMENT

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.

4. 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.)

5. 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. Noted applicable design criteria are identified in Table 1 of this regulatory guide.

#3. 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.

HG:E COMMENT

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.

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Table 1

DESIGN CRITERIA[1]

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

INSTRUMENTATION TYPES[2]: A, B, C, D, E

[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

[5]Qualified to the conditions of its operation and, for radiation monitors, ANSI N320-1979.
[6]Emergency power source.
[7]Critical Instrument Bus - Class 1E 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.
#5 [14]~~Continuous display~~.
[15]Indication on demand.
[16]Where trend or transient information is essential to planned operator actions.
#5 [17]~~Recording~~.
[18]Dial or digital indication.
[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.

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PG&E COMMENT #6

Table 2

PWR VARIABLES

Measured Variable	Range	Type	Purpose
CORE			
Core Exit Temperature	150°F to 2300°F	B,C	ANS-4.5, Section 6.2.3. 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 positive indication that the control rods are fully inserted. (Minimum 5 days after accident)
Neutron Flux	1 c/s to 1% power ~~(at least one fission counter)~~	E	ANS-4.5, Section 6.2.2. For indication of approach to criticality.
REACTOR COOLANT SYSTEM			
RCS Hot Leg Temperature	150°F to 750°F	B	ANS-4.5, Section 6.2.3. To aid in determining reactor system subcooling and to provide indication of natural circulation.
RCS Cold Leg Temperature	150°F to 750°F	B	ANS-4.5, Section 6.2.3. To provide indication of natural circulation; to provide input for heat balance calculations; to provide direct indication of ECCS injection.
RCS Pressure	15 psia to 4000 psig	B,C	ANS-4.5, Sections 6.2.3 and 6.2.4. For indication of an accident and to indicate that actions must be taken to mitigate an event.
Pressurizer Level	Bottom tangent to top tangent	B,D	ANS-4.5, Section 6.2.3. To assure proper operation of the pressurizer and to assure safe operation of heaters. It is also used in conjunction with changes in reactor pressure to determine leak and void sizes.
Degree of Subcooling	200°F subcooling to 35°F superheat	E	For indication of margin in core cooling and the need for emergency coolant additions or reductions as the margin changes and to obviate the necessity to consult steam tables.

Table 2 (Continued)

Measured Variable	Range	Type	Purpose
REACTOR COOLANT SYSTEM (Continued)			
#7. Reactor Coolant Loop Flow	0 to 120%], -12% to 12%] design flow[1]	B,	To provide indication that the core is being cooled.
Primary System Safety Relief Valve Positions (including PORV and code valves) or Flow Through or Pressure in Relief Valve Lines	Closed-not closed	B,D	By these measurements the operator knows if there is a path open for loss of coolant and that an event may be in progress.
Radiation Level in Primary Coolant Water	10 μCi/cc to 10 Ci/cc	C	ANS-4.5, Section 6.3.2. For early indication of fuel cladding failure and estimate of extent of damage.
CONTAINMENT			
Containment Pressure	10 psia pressure to 3 times design pressure[2] for concrete; 4 times design pressure for steel	B,C	ANS-4.5, Sections 6.2.5, 6.3.3, 6.3.4, and 6.3.5. To indicate the integrity of the primary or secondary system pressure boundaries; to indicate the potential for leakage from the containment; to indicate integrity of the containment.
Containment Atmosphere Temperature	40°F to 400°F	E	For indication of the performance of the containment cooling system and adequate mixing.
Containment Hydrogen Concentration	0 to 10% (capable of operating from 10 psia to maximum design pressure[2])	B,C	ANS-4.5, Sections 6.2.5 and 6.3.5. For indication of the need for and to measure the performance of the containment hydrogen recombiner.

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[1]Design flow - the maximum flow anticipated in normal operation.
[2]Design pressure - that value corresponding to ASME code values that are obtained at or below code-allowable material design stress values.

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Table 2 (Continued)

	Measured Variable	Range	Type	Purpose
	CONTAINMENT (Continued)			
#8	Containment Isolation Valve Position	Closed-not closed	B,~~C~~	ANS-4.5, Section 6.2.5. To indicate the status of containment isolation and to provide information on the status of valves in process lines that could carry radioactive materials out of containment.
#9	Containment Sump Water Level	Narrow range (sump). Wide range (bottom of containment to 600,000-gallon level equivalent)	~~B~~,C	ANS-4.5, Section 6.3.3. For indication of leakage within the containment and to ensure adequate inventory for performance of the ECCS.
	High-Range Containment Area Radiation	1 to 10^7 R/hr (60 keV to 3 MeV photons with ±20% accuracy for photons of 0.1 to 3 MeV)[10^7 R/hr for photons is approximately equivalent to 10^8 rads per hour for betas and photons]	B,C	To help identify if an accident has degraded beyond calculated values and to indicate its magnitude to determine action to protect the public.
	SECONDARY SYSTEMS			
	Steam Generator Pressure	From atmospheric pressure to 20% above safety valve setting	D	For indication of integrity of the secondary system and an indication of capability for decay heat removal.
	Steam Generator Level	From tube sheet to separators	D	For indication of integrity of the secondary system and an indication of capability for decay heat removal.
	Auxiliary Feedwater Flow	0 to 110% design flow[1]	D	To indicate an adequate source of water to each steam generator upon loss of main feedwater.
#10	~~Main Feedwater Flow~~	~~0 to 110% design flow[1]~~	~~E~~	~~To indicate an adequate source of~~ water to each steam generator.

Table 2 (Continued)

Measured Variable	Range	Type	Purpose
SECONDARY SYSTEMS (Continued)			
Safety/Relief Valve Positions or Main Steam Flow	Closed-not closed	B,C	To indicate integrity of secondary system (vis-a-vis pipe break).
Radioactivity in Condenser Air Removal System	10^{-7} to 10^{5} μCi/cc Xe-133 calibration	E	To indicate leakage from the primary to the secondary system and measure of noble gas release rate to atmosphere.
Radioactivity in Effluent from Steam Generator Safety Relief Valves or Atmospheric Dump Valves	10^{-7} to 10^{5} μCi/cc (alternatively, ambient background to 2 Ci/sec/MWth) Xe-133 calibration	E	An indication of release from the secondary system and measure of noble gas release rate to atmosphere.
AUXILIARY SYSTEMS			
Containment Spray Flow	0 to 110% design flow[1]	D	For indication of system operation.
Flow in HPI System	0 to 110% design flow[1]	D	For indication of system operation.
Flow in LPI System	0 to 110% design flow[1]	D	For indication of system operation.
Emergency Coolant Water Storage Tank Level	Top to bottom	D	To determine the amount of water discharged by the ECCS. This provides indication of the nature of the accident, indication of the performance of the ECCS, and indication of the necessity for operator action.
Condensate Storage Tank Level	Plant specific	~~B,C~~ D	(For those plants where the condensate storage tank is the principal source of auxiliary feedwater.) To ensure water supply for auxiliary feedwater pumps.
Accumulator Tank Level	Top to bottom	D	To indicate whether the tanks have injected to the reactor coolant system.

PG&E COMMENT

Table 2 (Continued)

Measured Variable	Range	Type	Purpose
AUXILIARY SYSTEMS (Continued)			
Accumulator Isolation Valve Positions	Closed-not closed	D	To indicate state of the isolation valves (per Regulatory Guide 1.47).
RHR System Flow	0 to 110% design flow[1]	D	For indication of system operation.
RHR Heat Exchanger Out Temperature	32°F to 350°F	D	For indication of system operation.
Component Cooling Water Temperature	32°F to 200°F	D	For indication of system operation.
Component Cooling Water Flow	0 to 110% design flow[1]	D	For indication of system operation.
Flow in Ultimate Heat Sink Loop	0 to 110% design flow[1]	D	For indication of system operation.
Temperature in Ultimate Heat Sink Loop	30°F to 150°F	D	For indication of system operation.
Ultimate Heat Sink Level	Plant specific	D	To ensure adequate source of cooling water.
Heat Removal by the Containment Fan Coolers	Plant specific	B	To indicate system operation.
Boric Acid Charging Flow	0 to 110% design flow[1]	B	To provide indication of reactor cooling and inventory control in order to maintain adequate concentration for shutdown margin.
Letdown Flow	0 to 110% design flow[1]	D	For indication of reactor coolant inventory control and boron concentration control.
#13 Sump Level in Spaces of Equipment Required for Safety	To corresponding level of safety equipment failure	E	To monitor environmental conditions of equipment in closed spaces.
RADWASTE SYSTEMS			
High Level Radioactive Liquid Tank Level	Top to bottom	E	Available volume to store primary coolant.

Table 2 (Continued)

Measured Variable	Range	Type	Purpose
RADWASTE SYSTEMS (Continued)			
Radioactive Gas Hold-up Tank Pressure	0 to 150% of design pressure[2]	E	Available capacity to store waste gases.
VENTILATION SYSTEMS			
Emergency Ventilation Damper Position	Open-closed status	D	To ensure proper ventilation under accident conditions.
Temperature of Space in Vicinity of Equipment Required for Safety	30°F to 180°F	E	To monitor environmental conditions of equipment in closed spaces.
POWER SUPPLIES			
Status of Class 1E Power Supplies and Systems	Voltages and currents	D	To ensure an adequate source of electric power for safety systems.
Status of Non-Class 1E Power Supplies and Systems	Voltages and currents	E	To indicate an adequate source of electric power.
RADIATION EXPOSURE RATES INSIDE BUILDINGS OR AREAS WHERE ACCESS IS REQUIRED TO SERVICE SAFETY-RELATED EQUIPMENT			
Radiation Exposure Rates	10^{-1} to 10^{4} R/hr for photons (permanently installed monitors)	E	For measurement of high-range radiation exposure rates at various locations.
AIRBORNE RADIOACTIVE MATERIALS RELEASED FROM THE PLANT			
Effluent Radioactivity - Noble Gases	(Normal plus accident range for noble gas)	E	ANS-4.5, Section 6.2.6. To provide operator with information regarding release of radioactive noble gases on continuous basis.
.Containment	10^{-7} to 10^{5} µCi/cc Xe-133 calibration		Provisions should be made to monitor all potential pathways for release of gaseous radioactive materials to the environs in conformance with General Design Criterion 64. Note: Monitoring of individual effluent streams only is required where such streams are released directly to the environment. If two or more streams are combined prior to release from a common discharge point, monitoring of the combined stream is considered to meet the intent of this guide provided such monitoring has a range adequate to measure worst-case releases.
.Secondary Containment (Reactor shield building annulus)	10^{-7} to 10^{4} µCi/cc Xe-133 calibration		

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FG&E COMMENT (NO COMMENTS PAGE 17)

Table 2 (Continued)

Measured Variable	Range	Type	Purpose
AIRBORNE RADIOACTIVE MATERIALS RELEASED FROM THE PLANT (Continued)			
.Auxiliary Building including buildings containing primary system gases, e.g., waste gas decay tank	10^{-7} to 10^{3} μCi/cc Xe-133 calibration		
.Other Release Points (including fuel handling area if separate from auxiliary building)	10^{-7} to 10^{2} μCi/cc Xe-133 calibration (permanently installed monitors)		
Effluent Radioactivity - High-Range Radiohalogens and Particulates	10^{-3} to 10^{2} μCi/cc (permanently installed monitors)	E	To provide the operator with information regarding release of radioactive halogens and particulates. Continuous collection of representative samples followed by monitoring (measurements) of samples for radiohalogens and for particulates.
Environs Radioactivity - Exposure Rate	10^{-6} to 10^{2} R/hr (60 keV to 3 MeV) (permanently installed monitors)	E	ANS-4.5, Section 6.3.4. For estimating release rates of radioactive materials released during an accident from unidentified release paths (not covered by effluent monitors) - continuous readout capability. (Approximately 16 to 20 locations - site dependent.)
Environs Radioactivity - Radiohalogens and Particulates	10^{-9} to 10^{-3} μCi/cc for both radiohalogens and particulates (permanently installed samplers)	E	For estimating release rates of radioactive materials released during an accident from unidentified release paths (not covered by effluent monitors). Continuous collection of representative samples followed by monitoring (measurements) of the samples. (Approximately 16 to 20 locations - site dependent.)

Table 2 (Continued)

Measured Variable	Range	Type	Purpose
AIRBORNE RADIOACTIVE MATERIALS RELEASED FROM THE PLANT (Continued)			
Plant and Environs Radioactivity (portable instruments)	High Range 0.1 to 10^4 R/hr photons 0.1 to 10^4 rads/hr betas and low-energy photons	E	During and following an accident, to monitor radiation and airborne radioactivity concentrations in many areas througnout the facility and the site environs where it is impractical to install stationary monitors capable of covering both normal and accident levels.
	100-channel gamma-ray spectrometer	E	During and following an accident, to rapidly scope the composition of gamma-emitting sources.
POSTACCIDENT SAMPLING CAPABILITY			
Primary Coolant Sumps Containment Air	As required based on Regulatory Guide 1.4 guidelines	E	ANS-4.5, Section 6.3.2. To provide means for safe and convenient sampling. These provisions should include:
POSTACCIDENT ANALYSIS CAPABILITY (ON SITE)	1. gamma-ray spectrum 2. pH 3. hydrogen 4. oxygen 5. boron	E	1. Shielding to maintain radiation doses ALARA, 2. Sample containers with container-sampling port connector compatibility, 3. Capability of sampling under primary system pressure and negative pressure, 4. Handling and transport capability, and 5. Pre-arrangement for analysis and interpretation.
METEOROLOGY			
Wind Direction	0 to 360° (±5° accuracy with a deflection of 15°. Starting speed 0.45 mps (1 mph))	E	For determining effluent transport direction for emergency planning, dose assessment, and source estimates.

Table 2 (Continued)

Measured Variable	Range	Type	Purpose
METEOROLOGY (Continued)			
Wind Speed	0 to 30 mps (67 mph) (±0.22 mps (0.5 mph) accuracy for wind speeds less that 11 mps (25 mph), with a starting threshold of less than 0.45 mps (1 mph))	E	For determining effluent travel speed and dilution for emergency planning, doses assessments, and source estimates.
Temperature	-60°F to 120°F (±0.9°F accuracy)	E	For determining nature of precipitation and ground deposition for emergency planning.
Vertical Temperature Difference	-9°F to +9°F (±0.3°F accuracy per 164-foot intervals)	E	For determining effluent diffusion rates for emergency planning, dose assessments, and source estimates.
Precipitation	Recording rain gage with range sufficient to ensure accuracy of total accumulation within 10% of recorded value - 0.01" resolution	E	For determining effluent transport and ground deposition for emergency planning.

ATTACHMENT B

COMMENTS ON THE FEASIBILITY OF
APPLYING REGULATORY GUIDE 1.97, REVISION 2
TO DIABLO CANYON POWER PLANT

PACIFIC GAS AND ELECTRIC COMPANY

On December 13, 1979, we met with the NRC to discuss the feasibility of designing and installing instruments meeting the requirements of proposed Revision 2 to Regulatory Guide 1.97 at Diablo Canyon. The following comments specifically address that feasibility. It is to be understood that these comments only address feasibility; they are not necessarily our total comments on the Regulatory Guide. Comments on the guide itself are in a separate document. In that context, these comments address Table 2 "PWR Variables," and Table 1, "Design Criteria", as it applies to Diablo Canyon.

General Comments:

It is important to note that while individual devices may be quite feasibly added, the cumulative additions may be impossible with our existing control room. There are several issues involved here.

When the issue of post accident monitoring first came up after TMI, our initial reaction was to supply a separate post accident monitoring panel. It was intended that this panel house all of the recorders and high level readouts needed after an accident. After much discussion, we have concluded that this is not the best thing to do. When an abnormal event occurs, it is most important that the operator use instruments that he has a working familiarity with. These instruments are on the control board and are laid out in a logical, systematic order with which he is familiar. When he is required to react, it would be most imprudent to ask him to leave the board and go to a PAM panel. This is not to say that a PAM panel is unacceptable. There are certain parameters (e.g., containment hydrogen or water level) that he doesn't normally use which could be mounted there.

Reams of paper could be produced discussing this point and all of the ramifications, but the bottom line is that we do not feel that it is legitimate to use the existence of a new PAM panel as a justification for adding as many instruments as we can fit in. We do not believe that any parameters used for normal operation can be put on the PAM panel if we expect the operator to use them properly. Therefore, the overall feasibility of adding control room instruments may be more limited than individual feasibilities.

We have a particular problem with recorders. They require huge amounts of control board space. Every type A, B, or C parameter requires at least two recorders per loop to meet the Regulatory Guide. Relief from that requirement is critical. There are two changes that could help. The first is to eliminate all recorders except those needed to provide historical or trend information to the operator. Many of these parameters are not. The second change is to allow a single recorder for any parameter. Our current method is to provide one indicator for each redundant channel and a recorder which can be switched between them to provide trending information.

Another area which we have problems with is radiation monitoring. We have a complete radiation monitoring system. The racks are full. The new instruments we are adding will not be a part of that system. We are providing limited capability in our PAM panel. If the number we add is large, we run into problems. The steam line relief valve monitors alone would overextend our capabilities. If we are asked to extend the ranges of our existing equipment, this will entail new instruments for which we will have to provide locations. We do not know that we have the room in our control room for the additional racks which would be required.

These problems are compounded by the fact that our cable spreading room is full. We can add neither new conduits nor new racks. Our racks are below the control room in the cable spreading room. This makes our control room very compact, but it has caused extreme cable spreading room problems. About the only options we can see involve running conduit outside the building along the side to a roof entry. The impact on our suspended, lighted ceiling could be disasterous, to say nothing of the architecture of the room (which we realize is insignificant in these considerations).

We have a problem with the requirement to environmentally qualify the Type D instruments. Almost all of these are presently not qualified, but are outside of containment and could be subject to low level elevated environments (200°F @ atmospheric pressure). This requirement will force wholesale replacement programs.

Finally, we are totally unable to produce qualifications for instruments for 200 day post accident operation.

With those general comments aside, our variable-by-variable status and feasibility is as follows:

Variable:	Core Exit Temperature	Type:	B, C
Range:	150°F to 2300°F	Diablo:	100°F to 700°F

The incore thermocouple system is neither environmentally nor seismically qualified. Qualification would involve the replacement of the reference junctions and possibly some wiring and connections inside containment. The physical arrangement does not lend itself to seismic testing without mocking up some part of the core assembly. Separation, if required to meet single failure criteria, would involve extensive redesign of the system and the reactor vessel.

Readout in the control room is presently 100-700°F, using a switchable indicator. Additionally, computer readout is from 0-1650°F. It would be feasible to add strip chart recorders which could trend several points per recorder, with appropriate switching to select points, logging recorders could provide more points, and 50 points could be accommodated, but the greater the number of points, the less visible are the trends. I don't think that more than about 6 points are reasonable to trend. The recorder range could be 0-2300°F without major problems. Unfortunately, our stainless steel sheathed thermocouples are not capable of withstanding temperatures above 1650°F for extended periods. If this is unacceptable, the entire system would have to be redesigned to incorporate inconel thermocouples.

Variable:	Control Rod Position	Type:	D
Range:	Full in or not full in.	Diablo:	Full range indication

The digital rod position indication system has electronic racks inside containment which manipulate and multiplex position signals. It would be totally unreasonable to move them to outside the containment (if for no other reason; there aren't enough spare penetrations) and it would be virtually impossible to environmentally qualify them. They do provide the required indication.

Variable: Neutron Flux. Type: E
Range: 1 c/s to 1% power. Diablo: 1 c/s to 10^6 c/s (source range)

This parameter exists, but it does not have a fission counter. I have been informed that a fission counter with the low range required would not survive normal power power operation and, therefore, cannot be used.

Variable: RCS Hot Leg Temperature Type: B
Range: 150°F to 750°F Diablo: 0°F to 700°F

This parameter exists, and the recorder range could be changed, if required. We have the standard Westinghouse 4 loop configuration with only one hot leg wide range RTD per loop. Single failure criteria would have to be met by diversity. If mutually redundant RTDs were required on each of the 4 loops, we would have to add four new instrument loops and re-hydro our reactor coolant system.

Variable: RCS Cold Leg Temperature Type: B
Range: 150°F to 750°F. Diablo: 0°F to 700°F

Same comments as given for hot leg temperature above.

Variable: RCS Pressure Type: B, C
Range: 0-4000 psig Diablo: 0-6750 psig (being added)
0-3000 psig

No changes required.

Variable: Pressurizer Level Type: B, D
Range: Bottom to top tangents, Diablo: See below

The Diablo pressurizer level is a wide range device which doesn't extend from tangent to tangent, but meets the basic intent. Three separate indicators are provided with one recorder which can be switched between them. Installing a redundant recorder adjacent to the existing one would be impossible without major control board redesign.

Variable:	Degree of Subcooling	Type:	E
Range:	$200^{o}F$ sub. to $35^{o}F$ superheat	Diablo:	-40 to $+200^{o}F$ subcooling (being added)

No changes.

Variable:	Reactor Coolant Loop Flow	Type:	B, D
Range:	0 to 120% -12% to +12%	Diablo:	0-120%

There are 3 flow indicators on each of 4 loops, a total of 12. We do not record reactor coolant flow. We feel there is relatively little value in recording this variable. If this is required, space which does not presently exist would have to be added to the control board. We do not know how we would accomplish this without major modifications.

It would be virtually impossible to add low flow and reverse low flow indication at Diablo Canyon. A total redesign of the reactor coolant system would be required. Certain methods have been suggested which would generate differential pressures on the order of 1" H_2O. Such a low differential as a valid reading would be impossible to detect with any instrumentation capable of standing the system pressures involved, to say nothing of the environment. The only devices that I could find for such a low DP had ratings on the order of magnitude of 25 psig.

Variable:	Primary System Safety Valve and PORV position	Type:	B, D
Range:	Closed, not closed.	Diablo:	Safety-Acoustic (being added) PORV Limit Switch

These parameters are not recorded, and we do not think they should be. They also are not redundant on each valve. Single failure criteria can be met by observing relief tank parameters.

Variable:	Radiation Level in Primary Coolant	Type:	C
Range:	10 Ci/cc to 10 Ci/cc	Diablo:	10^{1}-10^{6} CPM

If a single sample point with redundant off-line monitors outside containment is acceptable, we can provide this indication, assuming the monitors are available. Our existing gross failed fuel detector does not have the required range. Redundant recorders would have to be added in the control room.

Variable:	Containment Pressure	Type:	B, C
Range:	10 psia to 3X design	Diablo:	5 to +55 psig
			0 to 200 psig (being added)

The monitors that go below atmospheric pressure have indicators but not recorders. Again, space limitations make this a very difficult addition to the control board.

Variable:	Containment Air Temperature	Type:	E
Range:	40^{o}F to 400^{o}F	Diablo:	60^{o}F - 120^{o}F

This variable is not indicated in the control room. The range could be expanded and control room indication provided with some work assuming space could be found.

Variable:	Containment Hydrogen	Type:	B, C
Range:	0-10%	Diablo:	0-10% (being added for January 1981)

No change required.

Variable:	Containment Isolation Valve Position	Type:	B, D
Range:	Closed-not closed.	Diablo:	Limit Switches

These parameters are not recorded and they are not redundant. Check valves and similar valves have no indication. Any of these changes could be extremely difficult.

Variable:	Containment Sump Level	Type:	B, C
Range:	Narrow - Sump Wide - Containment to 600,000 gal.	Diablo:	Bottom of sump to flood level Bottom of containment to 600,000 gal. (being added for January 1981)

The narrow range sump level is indicated but not recorded. Again, space limitations make this a very difficult addition to the control board.

Variable:	Containment Radiation.	Type:	B, C
Range:	1-10^7 R/hr.	Diablo:	1-10^7 R/hr. (being added for January 1981)

No change required.

Variable:	Steam Generator Pressure	Type:	D
Range:	Safety setting to +20%.	Diablo:	0-1200 psig (= 109% of top safety)

If we increase the range, we will affect the accuracy, and thus the safety function of the parameter. We would prefer not to do this.

Variable:	Steam Generator Level	Type:	D
Range:	Tube Sheet to Separator	Diablo:	See below

Our wide range level stops about 6 feet short of the separator, but covers the entire useful range of the steam generator.

Variable:	Auxiliary Feedwater Flow.	Type:	D
Range:	0-110% of design.	Diablo:	0-136% of design

These are not environmentally qualified devices. Otherwise, no change is required.

Variable:	Main Feedwater Flow	Type:	E
Range:	0-100% of design	Diablo:	0-117% of design

No change required.

Variable:	Safety/Relief Valve Position or Main Steam Flow	Type:	B, D
Range:	Closed-not closed	Diablo:	Main steam flow

No change required.

Variable:	Condensate Air Ejector Radiation	Type:	E
Range:	10^{-7} to 10^{5} Ci/cc.	Diablo:	10^{-6} to 10^{-3} Ci/cc

The existing monitor cannot be modified to handle this range change, but assuming a suitable monitor is available, it can be installed with little difficulty. The problem with the readout is given in the general comments.

Variable:	Steam Generator Relief Valve Radiation	Type:	E
Range:	10^{-7} to 10^{5} Ci/cc	Diablo:	None

It would be virtually impossible to monitor the relief valve piping. The size of an inline device would be prohibitive. An off-line device would fill with water. If we condense the steam and measure the water, we lose all noble gases. Assuming that we could use an area type monitor above the effluent, such a monitor could be added (actually a minimum of 4 monitors would be required due to the diverse locations of the 4 loop reliefs.)

Variables:	Containment Spray Flow HPI Flow LPI Flow RHR Flow Component Cooling Water Flow	Type:	D
Range:	0-110% of design	Diablo:	0-110% or better

None of these parameters are environmentally qualified, but otherwise no change is required.

Variable:	Emergency Coolant Water Storage Tank Level	Type:	D
Range:	Top to bottom	Diablo:	Approx. top to bottom

No change required.

Variable:	Condensate Storage Tank Level	Type:	B, C
Range:	Plant Specific	Diablo:	Approx. top to bottom

Our indication is not redundant, and is not safety grade, but it is seismically qualified. It is continuously indicated, but not recorded. The addition of a redundant transmitter with recorders could be done if we could use the same taps on the tank. This would encounter the control board location problem described in the general comments.

Variable:	Accumulator Tank Level	Type:	D
Range:	Top to bottom.	Diablo:	Tech. spec. range (narrow)

Our existing transmitters cannot be extended in range without affecting accuracy and thus tech spec. requirements. New transmitters could be added to the existing taps which cover the range from tangent to tangent. Because the top and bottom are domes, and the center section is relatively short, this only covers about one half of the volume. Inlet and discharge lines on the top and bottom of the tank could be tapped to provide wide range indication.

Variable:	Accumulator Isolation Valve Position	Type:	D
Range:	Closed-not closed.	Diablo:	Closed-open

The position switches are not environmentally qualified, but otherwise no change is required.

Variable:	RHR Heat Exchanger Outlet Temperature Component cooling water temperature	Type:	D
Range:	32°F to 350°F	Diablo:	50°F to 400°F

The transmitters are not environmentally qualified, but otherwise no change is required.

Variable:	Ultimate Heat Sink Loop Flow	Type:	D
Range:	0-110% of Design	Diablo:	None

This would be an extremely difficult, if not impossible, parameter to retrofit. The auxiliary saltwater piping is buried 24 inch "paralined" carbon steel pipe. We do have a traverse point for testing where an annubar is used to test the flow. Although this could be permanently installed, our experience with annubars is such that we fear leaving them in line to break off and catch in something downstream.

Variable:	Ultimate Heat Sink Loop Temperature	Type:	D
Range:	30°F to 150°F	Diablo:	0-130°F

This is presently a local indication. Taking it to the control room is feasible. Our main discharge temperature monitoring system does read out in the control room, but it does not reflect the auxiliary saltwater temperature due to the huge flow ratios. Since our heat sink is the ocean, this parameter is not very important anyway.

Variable:	Ultimate Heat Sink Level	Type:	D
Range:	Plant Specific.	Diablo:	None

Our ultimate heat sink is the Pacific Ocean. Level measurement is not applicable.

Variable:	Heat Removal by Containment Fan Coolers	Type:	B
Range:	Plant Specific.	Diablo:	See below

No continuously recorded method exists for discerning the amount of heat removed by the containment fan coolers. We have a manual system whereby the operator drains the tail pipe, isolates, and times the rise in tail pipe. This determines the amount of condensate removed by the fan cooler, and is all done from the control room at a switch module. The feasibility of measuring the heat removal is a function of the sophistication required.

Variable:	Boric Acid Charging Flow	Type:	B
Range:	0-110% of design flow	Diablo:	0-100% of max. flow

Presently, this flow rate is not recorded, is not redundant, and is not environmentally or seismically qualified. The piping would have to be reconfigured to put in a redundant flow transmitter. Adding recorders is feasible but subject to the location problems on the main control board described previously. Seismic qualification can be accomplished easily enough; there is nothing likely to fail in a seismic event. Environmental qualification could be very difficult.

Variable:	Sump Levels in safety equipment	Type:	D
Range:	As appropriate.	Diablo:	See below.

Most equipment is in rooms which have drain pipes large enough to handle flood conditions. No sumps are provided. In those rooms where sumps exist, there are high alarms for the sumps, but no level indications. Addition of level indication is quite feasible, but we feel its value is not sufficient to justify the additional control board clutter it would generate.

Variable:	High Level Radioactive Liquid Tank Level	Type:	E
Range:	Top to bottom.	Diablo:	Approx. top to bottom

No change required.

Variable:	Radioactive gas holdup tank pressure	Type:	E
Range:	0-150% of design	Diablo:	0-100% of desig

The design pressure of the tank is 150 psig. The maximum output pressure capability of the compressors is 110 psig. The transmitters are pneumatic and don't indicate in the control room. Addition of control room indication is feasible, but the loop would have to be totally re-designed.

Variable:	Emergency Ventilation Damper Position	Type:	D
Range:	Open-close status	Diablo:	Open-close status

The status lights are in the ventilation room above the control room with alarm in the control room if the dampers are not properly aligned. Putting all of the status lights in the control room would require the use of large amounts of space not currently available.

Variable:	Safety Equipment Space Temperature	Type:	D
Range:	$30^{O}F$ to $180^{O}F$	Diablo:	Area dependent

The readout is not in the control room, but in the cable spreading room. A high alarm in the control room indicates that the design temperature of the equipment has been exceeded in an area. Readout in the control room could be added.

Variable:	Status of Class IE Power Supplies	Type:	D
	Status of Non-IE Power Supplies	Type:	E
Range:	Voltage and current.	Diablo:	Voltage and current

No change required.

Variable:	Area Readiation where access is required.	Type:	E
Range:	10^{-1} to 10^{4}R/hr.	Diablo:	10^{-1} to 10^{4} mR/hr.

This is a factor of 10^3 above our existing monitors. Such monitors could be added given the space in the control room if this high a range would be required. We would not wish to re-range our existing monitors since the mR/hr range is much more useful for personnel access considerations.

Variable:	Noble Gas Effluent Radiation	Type:	E
Range:	10^{-7} to 10^{-5} μCi/cc.	Diablo:	10^{-7} to 10^{-5} μCi/cc (being added)

No change required.

Variable:	Radio Halogen & Particulate Effluent Radiation.	Type:	E
Range:	10^{-3} to 10^{2} μCi/cc (sample).	Diablo:	10^{-3} to 10^{2} μCi/cc (being added)

No change required.

Variable:	Environs Radiation Exposure Rate	Type:	E
Range:	10^{-6} to 10^{2} R/hr.	Diablo:	None

Although we consider 16 monitors to be excessive for a coastal plant with land in an arc of only 180°, this is indeed feasible to provide at some expense. Due to the previously stated space considerations, we would avoid a control room readout at all costs.

Variable:	Environs Radioactivity Halogens and Particulates	Type:	E
Range:	10^{-9} μCi/cc to 10^{-3} μCi/cc.	Diablo:	None

Although the number of points is excessive for a coastal plant, this is feasible to monitor.

Variable:	Plant and Environs Radioactivity (portable)	Type:	E
Range:	10^{-1} to 10^{4} R/hr. 100 channel MCA	Diablo:	Multiple

No change required.

Variable:	Samples - Primary Coolant, Containment Air, Sumps	Type:	E

Samples of primary coolant and containment air exist. We don't presently sample sumps, but we do have the capability to sample the pumped effluent from some sumps. Feasibility would be dependent on the sumps to be sampled, and whether or not pumped effluent could be monitored.

Variable:	Analysis Capability	Type:	E

1. Gamma Ray Spectrum
2. pH
3. Hydrogen
4. Oxygen
5. Boron

No problems.

Variable:	Wind direction	Type:	E
Range:	0-360°	Diablo:	0-360°

No change required.

Variable:	Wind Speed	Type:	E
Range:	0 to 67 MPH	Diablo:	0-100 MPH

No change required.

Variable:	Temperature	Type:	E
Range:	-60°F to 120°F	Diablo:	0-120°F

We feel that this is adequate for a California coastal plant.

Variable:	Vertical temperature difference	Type:	E
Range:	$-9^{o}F$ to $+9^{o}F$	Diablo:	$-6^{o}F$ to $+18^{o}F$ (recorded) Full temperature range capability (indicated)

No change required.

Variable:	Precipitation	Type:	E

No change required.