

CONFORMANCE TO REGULATORY GUIDE 1.97
DIABLO CANYON NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2

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Published May 1984

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Prepared for the
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under DOE Contract No. DE-AC07-76ID01570
FIN No. A6493

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1. INTRODUCTION

On December 17, 1982, Generic Letter No. 82-33 (Reference 1) was issued by D. G. Eisenhut, Director of the Division of Licensing, Nuclear Reactor Regulation, to all licensees of operating reactors, applicants for operating licenses and holders of construction permits. This letter included additional clarification regarding Regulatory Guide 1.97, Revision 2 (Reference 2) relating to the requirements for emergency response capability. These requirements have been published as Supplement 1 to NUREG-0737, "TMI Action Plan Requirements" (Reference 3).

The Pacific Gas and Electric Company, the applicant for the Diablo Canyon station, provided a response to the generic letter on April 18, 1983 (Reference 4). The letter provided a schedule for the submittal of additional information. By letter dated September 9, 1983, (Reference 5) the licensee provided additional information on conformance to Regulatory Guide 1.97/Rev. 3.

This report provides an evaluation of these submittals.

2. REVIEW REQUIREMENTS.

Section 6.2 of NUREG-0737, Supplement 1, sets forth the documentation to be submitted in a report to the NRC describing how the licensee meets the guidance of Regulatory Guide 1.97 as applied to emergency response facilities. The submittal should include documentation that provides the following information for each variable shown in the applicable table of Regulatory Guide 1.97.

1. Instrument range
2. Environmental qualification



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3. Seismic qualification
4. Quality assurance
5. Redundance and sensor location
6. Power supply
7. Location of display
8. Schedule of installation or upgrade.

Further, the submittal should identify deviations from the guidance in the Regulatory Guide and provide supporting justification or alternatives.

Subsequent to the issuance of the generic letter, the NRC held regional meetings in February; and March 1983 to answer licensee and applicant questions and concerns regarding the NRC policy on this matter. At these meetings, it was noted that the NRC review would only address exceptions taken to the guidance of Regulatory Guide 1.97. Further, where licensees or applicants explicitly state that instrument systems conform to the provisions of the guide it was noted that no further staff review would be necessary. Therefore, this report only addresses exceptions to the guidance of Regulatory Guide 1.97. The following evaluation is an audit of the applicant's submittals based on the review policy described in the NRC regional meetings.

3. EVALUATION

The licensee provided a response to the NRC generic letter 82-33 on April 18, 1983. A later submittal dated September 9, 1983, describes the licensee's position on post-accident monitoring instrumentation. This evaluation is based on these submittals.



3.1 Adherence to Regulatory Guide 1.97

The licensee states that they have elected to comply with Revision 3 of Regulatory Guide 1.97 (Reference 6). Therefore, it is concluded that the licensee has provided an explicit commitment on conformance to the guidance of Regulatory Guide 1.97, except for those exceptions that were justified as noted in Subsection 3.3. Information on the schedule for installation for Unit 1 was provided; this information for Unit 2 will be submitted prior to Unit 2 fuel load.

3.2 Type A Variables

Regulatory Guide 1.97 does not specifically identify Type A variables, i.e., those variables that provide information required for operator controlled safety actions. The licensee has not identified which instrumentation channels are Type A variables. By the licensee's explicit commitment on conformance, it is assumed that all Type A variables comply with the Regulatory Guide 1.97 Category 1 recommendations. However, the licensee should identify these Type A variables and commit to the Category 1 recommendations for these variables.

3.3 Exceptions to Regulatory Guide 1.97

The licensee identified the following exceptions to the requirements of Regulatory Guide 1.97.

3.3.1 Reactor Coolant System Soluble Boron Concentration

The range of the instrumentation supplied by the licensee for this variable is 0 to 5000 parts per million. The range recommended in the regulatory guide is 0 to 6000 parts per million. The licensee's justification for this deviation from the recommended range is that the boron concentration is not expected to exceed 5000 parts per million, and that if a higher range is needed, grab samples can be used. However, the licensee has not shown that the proposed range is inclusive of the maximum boron concentration in the



reactor coolant system, including post-accident conditions such as a loss of coolant accident. The licensee should provide a more complete basis for accepting the range of 0 to 5000 parts per million by providing an analysis showing that the range is inclusive of all expected boron concentrations.

3.3.2 Radioactivity Concentration or Radiation Level in Circulating Primary Coolant

The licensee states that a qualified device is not available for this function. Instrumentation that is suitable for this variable has been under research and development. We understand that some systems are now available, but not qualified for an in-containment environment.

The licensee should commit to evaluate systems for this variable as they become available and commit to installation of a satisfactory system within a reasonable time frame after availability.

3.3.3 Effluent Radioactivity--Noble Gas Effluent from Condenser Air Removal System Exhaust

The range of the instrumentation supplied by the licensee for this variable is 10^{-4} to 3 $\mu\text{Ci}/\text{cc}$. The range recommended by the regulatory guide is 10^{-6} to 10^{-2} $\mu\text{Ci}/\text{cc}$ (Type C) and 10^{-6} to 10^5 $\mu\text{Ci}/\text{cc}$ (Type E). This deviation from the recommended range is justified by the licensee in that the air ejector exhaust is routed to the plant vent. The instrumentation for the common plant vent system has a range from 10^{-6} $\mu\text{Ci}/\text{cc}$ to 10^4 $\mu\text{Ci}/\text{cc}$ which is consistent with the recommendations of the regulatory guide. Therefore, we find this deviation acceptable.

3.3.4 Containment Effluent Radioactivity--Noble Gases from Steam Generator Blowdown Tank Vent

The range of the instrumentation supplied by the licensee for this variable is 2×10^{-6} to 2×10^{-2} $\mu\text{Ci}/\text{cc}$. The range recommended by the regulatory



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guide is 10^{-6} to 10^{-2} $\mu\text{Ci/cc}$. The licensee states that the range of the installed instrumentation is adequate. The deviation in range is minor and therefore acceptable.

For this variable the licensee provided Category 3 instrumentation instead of Category 2 as recommended by the regulatory guide. The licensee has not shown that Category 3 instrumentation is adequate to monitor blowdown tank vent during and following an accident. The licensee should provide satisfactory justification showing why this exception is acceptable. As part of this justification the licensee should address environmental qualification, power supply and quality assurance.

3.3.5 Residual Heat Removal Heat Exchanger Outlet Temperature

The licensee has supplied instrumentation for this variable that has a minimum range of 50°F rather than 40°F as specified in Revision 3 of Regulatory Guide 1.97. The justification for this deviation as stated by the licensee is that the residual heat removal (RHR) outlet is not expected to be less than 50°F . This is due to an alarm on the component cooling water (this removes heat from the heat exchangers), that indicates temperatures less than 60°F . The licensee has not shown that written procedures will be followed should this alarm sound, nor indicated what steps would be taken to ensure the RHR heat exchanger outlet temperature remains on scale. The licensee has not referred to an analysis that shows the correlation between the component cooling water (CCW) temperatures and the residual heat removal (RHR) water temperature.

Based on the justification and information supplied by the licensee, we find that the deviation in the minimum temperature scale for the outlet temperature of the residual heat removed heat exchanger is unacceptable.

The licensee should provide an analysis that shows his existing outlet temperature instrumentation will adequately cover the minimum temperatures expected during and following an accident.



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3.3.6. Accumulator Tank Pressure

The licensee has supplied instrumentation for this variable that has a maximum range of 700 psig rather than 750 psig as specified in Regulatory Guide 1.97. The licensee indicates that the pressure in the accumulators is limited to 700 psig by relief valves. The pressure is manually controlled to within technical specification limits and no accident conditions will cause the pressure to increase. Therefore the licensee's range of 0-700 psig is an acceptable deviation.

3.3.7 Boric Acid Charging Flow

The licensee has not indicated that the power supply for this instrumentation meets the high-reliability specification of Regulatory Guide 1.97, nor have they supplied environmentally qualified instrumentation for this variable.

Environmental qualification has been subsequently clarified by the environmental qualification rule, 10 CFR 50.49. It is concluded that the guidance of Regulatory Guide 1.97 has been superseded by a regulatory requirement. Any exception to this rule is beyond the scope of this review and should be addressed in accordance with Section (g) to 10 CFR 50.49.

Based on the above, we find that the deviation in the power supply for the boric acid charging flow is not acceptable. The licensee should provide the information requested in Generic Letter No. 82-33, Section 6.2 for this variable (power supply).

3.3.8 Pressurizer Heater Status

The licensee has supplied instrumentation for this variable that indicates 0 to 600 kilowatts rather than plant specific current as specified in the regulatory guide. The kilowatts of power into the pressurizer heaters is a direct relation to the heater current and voltage.



Based on our technical review and judgment, we find the deviation of measuring pressurizer heater input power rather than current acceptable since the heater power has a known relation to the heater current.

3.3.9 Steam Generator Pressure

The licensee has supplied instrumentation for this variable that indicates 0 to 1200 psig rather than to 20% above the lowest safety valve setting as specified in the regulatory guide. We have not been able to determine, from the information available to us, what the specified range should be.

The licensee states that this range is adequate due to redundant instrumentation and because all safety valves lift before 1200 psig. However, the licensee has not shown that the safety valves are sized for, and are capable of maintaining the steam generator pressure to less than the 1200 psig range supplied. Thus, we find that the licensee's justification for supporting this deviation is inadequate. The licensee should provide additional justification for this deviation, addressing what the range as recommended by the regulatory guide is and including such factors as: relief valve sizing, setpoint tolerance and drift, and instrumentation overall accuracy.

3.3.10 Heat Removal by Containment Fan Heat Removal System

The licensee has not provided instrumentation that monitors this variable directly. They do indicate that this variable is monitored by damper position, component cooling water flow and containment pressure and temperature.

The licensee has not shown that these other parameters are a direct measure of this variable or that fan operation is monitored. Additionally, the licensee has not shown that all of the instrumentation is designed and qualified to Category 2 recommendations. Therefore, we find the justification for this deviation unacceptable.



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3.3.11 Noble Gas--Common Plant Vent Flow

The licensee has provided Category 3 instrumentation for this variable, where Category 2 is specified in the regulatory guide. The licensee provided no justification for this deviation in the category specification.

Environmental qualification, specified for Category 2 instrumentation in the regulatory guide, has been subsequently clarified by the environmental qualification rule 10 CFR 50.49. It is concluded that the guidance of Regulatory Guide 1.97 has been superseded by a regulatory requirement. Any exception to this rule is beyond the scope of this review and should be addressed in accordance with Section (g) to 10 CFR 50.49.

The licensee indicates that quality assurance, another Category 2 recommendation, was not applied to this instrumentation. No justification for this deviation was given. The license should provide the basis for this deviation.

3.3.12 Noble Gas--Vent from Steam Generator Safety Relief Valves or Atmospheric Dump Valves

The licensee has supplied instrumentation for this variable that has a minimum range limit of 2×10^1 $\mu\text{Ci/cc}$ rather than 10^{-1} $\mu\text{Ci/cc}$ specified in the regulatory guide. The licensee did not supply a justification for this deviation. However, we find this deviation to be minor, and therefore, acceptable.

3.3.13 Particles and Halogens--All Other Identified Release Points

The regulatory guide specifies a range of 10^{-3} to 10^2 $\mu\text{Ci/cc}$ and 0 to 110 percent vent flow. The licensees has not identified the range of the flow measurement. They have identified the following range coverage:

10^{-12} to 10^{-7} $\mu\text{Ci/cc}$ --particulate monitor



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10^{-7} to 10^{-2} $\mu\text{Ci/cc}$ --iodine monitor

Up to 10^2 $\mu\text{Ci/cc}$ --post-accident grab sampling equipment.

They have not shown that particulates are measured over the entire 10^{-3} to 10^2 $\mu\text{Ci/cc}$ range. They have not shown that halogens are measured over the same range. Therefore, the deviation proposed by the licensee is not acceptable.

The licensee should provide the above information regarding range of measurement for vent flow, particulate range and halogen range.

4. CONCLUSIONS

Based on our review we find that the licensee either conforms to or is justified in deviating from the guidance of Regulatory Guide 1.97 with the following exceptions:

1. Reactor coolant system soluble boron concentration--the licensee should show by analysis that the proposed range is inclusive of all expected boron concentrations (Section 3.3.1).
2. Radiation level in circulating primary coolant--the licensee should commit to installing qualified instrumentation for this variable when it becomes available (Section 3.3.2).
3. Containment effluent radioactivity--noble gases from steam generator blowdown tank vent--the applicant should:
 - a. justify Category 3 instrumentation instead of Category 2,
 - b. justify not displaying this variable in the control room, and
 - c. show that the system isolates on instrument failure (Section 3.3.4).



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4. Residual heat removal heat exchanger outlet temperature--the licensee should provide an analysis that shows his existing outlet temperature instrumentation will adequately cover the minimum temperature expected during and following an accident (Section 3.3.5).
5. Boric acid charging flow--the licensee needs to address environmental qualification in accordance with Section (g) to 10 CFR 50.49, and show that the power supply for this instrumentation meets the high-reliability specification of Regulatory Guide 1.97 (Section 3.3.7).
6. Steam generator pressure--the licensee should show that the safety valves are sized for and are capable of maintaining the steam generator pressure to less than 1200 psig range supplied (Section 3.3.9).
7. Heat removed by containment fan heat removal system--the licensee should show that the alternative instrumentation proposed for this variable is Category 2, and that they directly measure this variable (Section 3.3.10).
8. Noble gas--common plant vent flow--the licensee needs to address environmental qualification, in accordance with Section (g) to 10 CFR 50.49, and justify the lack of quality assurance for this variable (Section 3.3.11).
9. Particulates and halogens--all other identified release points--the licensee should identify the flow range monitored and justify any deviation. They should also show that the particulates and halogens are monitored for the entire range of 10^{-3} to 10^2 $\mu\text{Ci/cc}$ (Section 3.3.13).
10. The schedule for installation of upgraded instrumentation for Unit 2 needs to be provided (Section 3.1).



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11. The licensee should identify plant specific Type A variables and commit to the Category 1 recommendations for these variables (Section 3.2).

5. REFERENCES

1. NRC letter, D. G. Eisenhut to all Licensees of Operating Reactors, Applicants for Operating Licenses, and Holders of Construction Permits, "Supplement No. 1 to NUREG-0737--Requirements for Emergency Response Capability (Generic Letter No. 82-33)," December 17, 1982.
2. Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident, Regulatory Guide 1.97, Revision 2, U.S. Nuclear Regulatory Commission (NRC), Office of Standards Development, December 1980.
3. Clarification of TMI Action Plan Requirements, Requirements for Emergency Response Capability, NUREG-0737 Supplement No. 1, NRC, Office of Nuclear Reactor Regulation, January 1983.
4. Pacific Gas and Electric Company letter, R. Ohlback to D. G. Eisenhut, NRC, "Generic Letter No. 82-33," April 18, 1983.
5. Pacific Gas and Electric Company letter, J. O. Schuyler to D. G. Eisenhut, NRC, "Regulatory Guide 1.97 (Revision 3) Report," September 9, 1983.
6. Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident, Regulatory Guide 1.97, Revision 3, NRC, Office of Nuclear Regulatory Research, May 1983.



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