

ENCLOSURE

CONFORMANCE TO REGULATORY GUIDE 1.97
PALISADES PLANT

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ABSTRACT

This EG&G Idaho, Inc., report reviews the submittals for Regulatory Guide 1.97, Revision 3, for the Palisades Plant and identifies areas of nonconformance to the regulatory guide. Exceptions to Regulatory Guide 1.97 are evaluated and those areas where sufficient basis for acceptability is not provided are identified.

FOREWORD

This report is supplied as part of the "Program for Evaluating Licensee/Applicant Conformance to R.G. 1.97," being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Systems Integration, by EG&G Idaho, Inc., NRC Licensing Support Section.

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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 licensees 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 No. 1 to NUREG-0737, "TMI Action Plan Requirements" (Reference 3).

Consumers Power Company, the licensee for the Palisades Plant, provided a response to the generic letter on April 14, 1983 (Reference 4). On September 13, 1983 (Reference 5), the licensee provided the information required by Section 6.2 of the generic letter.

This report provides an evaluation of these submittals.

2. REVIEW REQUIREMENTS

Section 6.2 of NUREG-0737, Supplement No. 1, sets forth the documentation to be submitted in a report to the NRC describing how the licensee complies with 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
3. Seismic qualification
4. Quality assurance
5. Redundance and sensor location
6. Power supply
7. Location of display
8. Schedule of instalaltion or upgrade

Furthermore, the submittal should identify deviations from 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 subject. At these meetings, it was noted that the NRC review would only address exceptions taken to Regulatory Guide 1.97. Furthermore, where licensees or applicants explicitly state that instrument systems conform to the regulatory guide, it was noted that no further staff review would be

necessary. Therefore, this report only addresses exceptions to Regulatory Guide 1.97. The following evaluation is an audit of the licensee's submittals based on the review policy described in the NRC regional meetings.

3. EVALUATION

The licensee provided a response to Section 6.2 of NRC Generic Letter 82-33 on September 13, 1983. This evaluation is based on that submittal.

3.1 Adherence to Regulatory Guide 1.97

The licensee submitted a schedule in their submittal, that indicates that they will conform with the recommendations of Regulatory Guide 1.97, Revision 3 (Reference 6). Therefore, it is concluded that the licensee has provided an explicit commitment on conformance to Regulatory Guide 1.97. Exceptions to and deviations from the regulatory guide are noted in Section 3.3.

3.2 Type A Variables

Regulatory Guide 1.97 does not specifically identify Type A variables, i.e., those variables that provide information required to permit the control room operator to take specific manually controlled safety actions. The licensee classifies the following instrumentation as Type A.

1. Degrees of subcooling
2. Steam generator pressure
3. Steam generator level
4. Pressurizer level

The above instrumentation meets the Category 1 recommendations consistent with the requirements for Type A variables, except as noted in Section 3.3.

3.3 Exceptions to Regulatory Guide 1.97

The licensee identified the following deviations and exceptions to Regulatory Guide 1.97. These are discussed in the following paragraphs.

3.3.1 Environmental Qualification Requirement Deviation

The licensee states that the current environmental qualification requirement for the variables listed in Appendix A was not addressed when these systems were designed.

Environmental qualification has been clarified by the Environmental Qualification Rule, 10 CFR 50.49. We conclude that 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 10 CFR 50.49.

Deviations other than environmental qualification are addressed elsewhere in this report.

3.3.2 Seismic Qualification Requirement Deviation

The licensee states that the current seismic qualification requirement for the following variables was not addressed when these systems were designed.

Neutron flux

Reactor coolant system (RCS) cold leg water temperature

RCS hot leg water temperature

RCS pressure

During the regional meetings in February and March 1983, the NRC indicated that the seismic portion of instrumentation qualification; for operating reactors, should comply with the seismic qualification program which was the basis for plant licensing.

The licensee should show that this instrumentation complies with the seismic qualification program in effect at the time of licensing, or provide a commitment to upgrade the instrumentation.

3.3.3 RCS Soluble Boron Concentration

Regulatory Guide 1.97 recommends a range of 0 to 6000 ppm for this variable. The licensee has provided instrumentation with a range of 0 to 2050 ppm. The licensee states that the range is within the limits for normal operation. For an accident, all dissolved boron that can be pumped into the RCS is injected, and the letdown side would be isolated to maintain flow into the primary system. Since the boron meter is on the letdown line, the licensee indicates that it would not be measuring primary system concentration at this time and therefore, the range of the instrument is adequate for its intended function.

The licensee takes exception to Regulatory Guide 1.97 with respect to post-accident sampling capability. This exception goes beyond the scope of this review and is being addressed by the NRC as part of their review of NUREG-0737, Item II.B.3.

3.3.4 RCS Cold Leg Temperature

The recorder for the RCS cold leg temperature instrumentation is powered from a non-Class 1E source. The licensee acknowledges this deviation from regulatory guide 1.97, but provides no justification. The licensee states that further review and analysis of this item will be necessary before the discrepancy can be resolved.

This instrumentation reads and records a key variable and should comply with Category 1 requirements. The licensee should change the power supply for this recorder to redundant Class 1E power sources.

3.3.5 RCS Pressure

The instrumentation provided for this variable does not meet the redundancy or power supply recommendations of Regulatory Guide 1.97. One pressure transmitter transmits wide range pressure to two indicators. The recorder for RCS pressure is powered from a non-Class 1E source. The licensee acknowledges these deviations from the regulatory guide, but

provides no justification. The licensee states that further review and analysis of the items will be necessary before the discrepancies can be resolved.

This instrumentation reads and records a key variable and should comply to Category 1 requirements. The licensee should provide redundant RCS pressure channels and Class 1E power for the instrumentation for this variable.

3.3.6 Core Exit Temperature

Regulatory Guide 1.97 recommends instrumentation with a temperature range of 200 to 2300°F for this variable. The licensee acknowledges a range deviation from the regulatory guide. However, the existing range is not provided and no justification for deviating from Regulatory Guide 1.97 was submitted. The licensee states that the core cooling instrumentation project will address any inadequacies.

The NRC is reviewing the acceptability of this variable as part of their review of NUREG-0737, Item II.F.2.

3.3.7 Degrees of Subcooling

Regulatory Guide 1.97 recommends instrumentation with a temperature range of 200°F subcooling to 35°F superheat for this variable. The licensee's submittal acknowledges a range deviation from the regulatory guide, however, the existing range is not provided. The licensee states that the existing range is limited by current inputs and that the subcooling margin monitor will be upgraded as part of core cooling instrumentation project.

The NRC is reviewing the acceptability of this variable as part of their review of NUREG-0737, Item II.F.2.

3.3.8 Containment Isolation Valve Position

The licensee has identified a power source deviation for this variable. However, no justification for this deviation was submitted by the licensee.

The licensee should change the power supply to meet the regulatory guide recommendations.

3.3.9 Radioactivity Concentration or Radiation Level in Circulating Primary Coolant

The licensee has one Category 3 channel of primary coolant radiation level instrumentation. In addition, this information can be provided by the post-accident sampling system.

Based on the alternate instrumentation provided by the licensee, we conclude that the instrumentation supplied for this variable is adequate, and therefore, acceptable.

3.3.10 Accumulator Tank Pressure

Regulatory Guide 1.97 recommends a pressure range of 0 to 750 psig for this variable. The instrumentation has a range of 0 to 300 psig. The maximum operating pressure for this tank is 250 psig and the relief valve settings on the tanks are set for 250 psig.

We find that the existing range is adequate to monitor any expected pressure. Therefore, this is an acceptable deviation from Regulatory Guide 1.97.

3.3.11 Pressurizer Level

The licensee has identified deviations from the Category 1 recommendations for environmental qualification, seismic qualification and redundancy. No justification was submitted by the licensee for these deviations.

Pressurizer level is a key variable requiring Category 1 instrumentation. In addition, the licensee has designated this variable as a Type A variable, which is necessary to provide information required to permit the control room operator to take specific manually controlled safety actions. The licensee should provide Category 1 instrumentation for the pressurizer level.

3.3.12 Quench Tank Level

The licensee has an existing range for this variable of 24 inches to 96 inches. Regulatory Guide 1.97 recommends a range from the top to the bottom of the tank. The licensee states that the tank is 114 inches high, and that the effective range is to 93.6 percent level at 96 inches. The tank would not be used if the level was below 24 inches.

The level that is maintained in this tank is approximately 60 percent volume. The existing low indication of this instrumentation is adequate to insure that the sparger is covered and sufficient fluid volume exists to quench the design basis steam release. The high indication is adequate to indicate sufficient gas volume to accept a pressurizer steam release without becoming overpressurized and to indicate in-leakage from the relief discharge system. Based on this information, we find the existing instrumentation to be adequate. Therefore, this is an acceptable deviation from the regulatory guide.

3.3.13 Quench Tank Temperature

Regulatory Guide 1.97 recommends a temperature range of 50 to 750°F for this variable. The licensee has provided a range of 0 to 300°F. The design temperature for this tank is 340°F. The licensee states that this is a vented tank and that the maximum temperature would be approximately 350°F. Since temperature would tend to lag behind pressure, the licensee indicates that the rupture disk would blow at 100 psig before the temperature got that high.

The range should be adequate to read the saturation temperature corresponding to the tank design pressure and rupture disk relief pressure (100 psig). The licensee should expand the existing instrumentation range to cover a minimum of 50 to 338°F.

3.3.14 Quench Tank Pressure

The licensee has provided instrumentation for this variable, with a pressure range of 0 to 25 psig. Regulatory Guide 1.97 recommends a pressure range of 0 to design pressure. The licensee acknowledges that the tank design pressure is 100 psig, but submitted no justification for deviating from the recommended range.

The licensee should install instrumentation with the range recommended by Regulatory Guide 1.97 for this variable.

3.3.15 Steam Generator Level

The licensee identified a seismic qualification deviation for this variable, but submitted no justification for the deviation.

Steam generator level is a key variable, requiring Category 1 instrumentation. In addition, the licensee has designated this variable as a Type A variable, which provides information required to permit the control room operator to take specific manually controlled safety actions. The licensee should upgrade this instrumentation to meet the Category 1 recommendations of Regulatory Guide 1.97 for Type A variables.

3.3.16 Steam Generator Pressure

The licensee has identified this as a Type A variable, which calls for Category 1 instrumentation. The instrumentation provided is Category 2. The licensee states that this instrumentation is classified as a Category 2 variable because the steam generator pressure is a backup to the steam generator level when isolating a steam generator during a main steamline break.

This Type A instrumentation is necessary to provide information required to permit the control room operator to take specific manually controlled safety actions. It should be Category 1 instrumentation. The licensee should upgrade this instrumentation to meet the Category 1 recommendations of Regulatory Guide 1.97 for Type A variables.

3.3.17 Main Feedwater Flow

Regulatory Guide 1.97 recommends a range of 0 to 110 percent of design flow for this variable. The provided instrumentation has a range of 0 to 12,000 gpm. The licensee indicates that this deviates from the recommended range and states that the existing range is adequate for indication of feedwater flow and that it meets the intent of the regulatory guide. However, the licensee did not state the design feedwater flow.

The licensee should state the design feedwater flow and supply the basis for finding the existing range acceptable.

3.3.18 Condensate Storage Tank Water Level

The licensee has identified a deviation from Regulatory Guide 1.97 for environmental qualification and seismic qualification for this variable. The licensee states that the power supply does not have seismic or environmental qualification.

Environmental qualification has been clarified by the Environmental Qualification Rule, 10 CFR 50.49. We conclude that 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 10 CFR 50.49.

The seismic qualification deviation should be justified by providing analysis that shows that this instrumentation conforms to the seismic qualification program in effect at the time of licensing, or provide a commitment to upgrade the instrumentation.

3.3.19 Containment Sump Water Temperature

The licensee has not provided direct reading instrumentation for this variable. The justification submitted by the licensee for this deviation is that the containment temperature monitors would indicate the same temperature as the sump water at saturation. In addition, after switchover to the recirculation mode, the sump water temperature can be monitored by reading the low pressure safety injection (LPSI) and containment spray (CS) pump discharge temperature.

The containment temperature monitors provide a limiting value of sump temperature. The diverse methods of determining containment sump water temperature are adequate to monitor the operation of the containment sump. Therefore, this is an acceptable deviation from Regulatory Guide 1.97.

3.3.20 Volume Control Tank Level

Regulatory Guide 1.97 recommends a top to bottom range for the level of this tank. The licensee has instrumentation with a range of 0 to 88 inches and considers this range adequate because it covers from 0 to 100 percent of the operating levels. The tank would be isolated by any safety injection system actuation.

As the range is adequate to monitor the operation of this tank, this is an acceptable deviation from Regulatory Guide 1.97.

3.3.21 Component Cooling Water Temperature to Engineered Safety Features (ESF) System

The licensee takes exception to the temperature range recommended by the regulatory guide for this variable (40 to 200°F). The licensee provides a range of 0 to 140°F. The licensee states that the discharge temperature of the component cooling water at the heat exchanger discharge will remain between 65 to 90°F. The range of the existing transmitter will cover this discharge temperature.

Since the temperature at the heat exchanger discharge is maintained between 65 and 90°F, the existing temperature range will adequately cover any expected component cooling temperature for the ESF system components. Therefore, this is an acceptable deviation from Regulatory Guide 1.97.

3.3.22 Component Cooling Water Flow to ESF System

The licensee has not provided instrumentation for this variable. No justification was submitted by the licensee. However, they stated that further review and analysis would be necessary before resolving the discrepancy.

Category 2 instrumentation, with a range 0 to 110 percent design flow, should be installed for this variable.

3.3.23 Radioactive Gas Holdup Tank Pressure

The licensee has provided instrumentation with a range of 0 to 120 psig for this variable. Regulatory Guide 1.97 recommends a range of 0 to 150 percent design pressure. The licensee states that the design pressure is 120 psig.

The licensee should either change the range of this instrument to comply with the range recommended by Regulatory Guide 1.97, or provide basis for accepting the existing range, showing that it cannot be exceeded under accident or post-accident conditions.

3.3.24 Particulates and Halogens

The licensee has taken exception to providing instrumentation for this variable as recommended by Regulatory Guide 1.97. The justification submitted by the licensee for this deviation is that guidance in NUREG-0737 (page II.F.1-7, Reference 7), shows that these monitors are not required.

NUREG-0737 (page II.F.1-7) states the following. Iodine gaseous effluent monitors are not considered to be practical at this time. Capability for effluent monitoring of radioiodines shall be provided with sampling followed by onsite laboratory analysis.

Regulatory Guide 1.97 recommends sampling with onsite analysis capability for this variable. The licensee should commit to meeting this recommendation by supplying instrumentation that will monitor the specified range for this variable.

3.3.25 Airborne Radiohalogens and Particulates

Plant and Environs Radiation

Plant and Environs Radioactivity

The licensee has taken exception to providing instrumentation for these variables as recommended by Regulatory Guide 1.97. The licensee states that this instrumentation is not necessary per Supplement No. 1 to NUREG-0737 which states that offsite dose monitors are not required pending further development.

This does not apply to these variables. Regulatory Guide 1.97 recommends portable sampling with onsite analysis capability or portable instrumentation for these variables. The licensee should meet this recommendation by supplying instrumentation that will monitor the specified ranges for these variables.

4. CONCLUSIONS

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

1. Environmental qualification requirement deviation--environmental qualification should be addressed in accordance with 10 CFR 50.49 for the 29 identified variables (Section 3.3.1).
2. Seismic qualification requirement deviation--the licensee should show that these four variables conform to the original design basis seismic requirements or upgrade the instrumentation so that the seismic requirements are met (Section 3.3.2).
3. RCS cold leg temperature--the licensee should change the existing power supply for the recorder to a Class 1E power source (Section 3.3.4).
4. RCS pressure--the licensee should provide redundant channels and Class 1E power for the instrumentation for this variable (Section 3.3.5).
5. Containment isolation valve position--the licensee should provide redundant Class 1E power sources (Section 3.3.8).
6. Pressurizer level--the licensee should upgrade this instrumentation to Category 1 (Section 3.3.11).
7. Quench tank temperature--the licensee should provide instrumentation that covers the tank saturation temperature (Section 3.3.13).
8. Quench tank pressure--the licensee should provide the 0 to 100 psig recommended range (Section 3.3.14).

9. Steam generator level--the licensee should upgrade this instrumentation to include seismic qualification (Section 3.3.15).
10. Steam generator pressure--the licensee should upgrade this instrumentation to Category 1 (Section 3.3.16).
11. Main feedwater flow--the licensee should state the design flow and justify the deviation (Section 3.3.17).
12. Condensate storage tank water level--environmental qualification for the power source for this variable should be addressed in accordance with 10 CFR 50.49; data should be provided that shows that the seismic qualification for the power source conforms to that required at the time of plant licensing (Section 3.3.18).
13. Component cooling water flow to ESF system--the licensee should provide this instrumentation for monitoring the operation of the cooling water system (Section 3.3.22).
14. Radioactive gas holdup tank pressure--the licensee should provide the recommended range or show that the existing range cannot be exceeded (Section 3.3.23).
15. Particulates and halogens--the licensee should provide sampling points and analysis equipment that meets the range and Category 3 requirements of Regulatory Guide 1.97 (Section 3.3.24).
16. Airborne radiohalogens and particulates--the licensee should provide portable sampling equipment and onsite analysis instrumentation that will read 10^{-9} to 10^{-3} $\mu\text{Ci/cc}$ (Section 3.3.25).
17. Plant and environs radiation--the licensee should provide Category 3 portable instrumentation with a range of 10^{-3} to 10^4 R/hr, photons and 10^{-3} to 10^4 rads/hr, beta radiation and low-energy photons (Section 3.3.25).

18. Plant and environs radioactivity--the licensee should provide portable instrumentation, such as a portable multichannel gamma ray spectrometer, to monitor areas throughout the facility and site environs (Section 3.3.25).

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, 1983.
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. Consumers Power Company letter, David J. Vandewalle to Director, Office of Nuclear Reactor Regulation, April 14, 1983.
5. Consumers Power Company letter, Kerry A. Toner to Director, Office of Nuclear Reactor Regulation, September 13, 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, U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Regulatory Research, May 1983.
7. Clarification of TMI Action Plan Requirements, NUREG-0737, NRC, Office of Nuclear Reactor Regulation, November 1980.

APPENDIX A
ENVIRONMENTAL QUALIFICATION

APPENDIX A
ENVIRONMENTAL QUALIFICATION

The following variables do not have environmentally qualified instrumentation. See Section 3.3.1.

Neutron flux

Reactor coolant system (RCS) cold leg water temperature

RCS hot leg water temperature

RCS pressure

Containment sump water level (narrow range)

Containment isolation valve position

Residual heat removal (RHR) system flow

RHR heat exchanger outlet temperature

Accumulator tank level and pressure

Accumulator isolation valve position

Boric acid charging flow

Flow in high pressure injection (HPI) system

Flow in low pressure injection (LPI) system

Refueling water storage tank level

Primary system safety relief valve positions

Pressurizer heater status

Steam generator level

Steam generator pressure

Safety/relief valve positions or main steam flow

Auxiliary or emergency feedwater flow

Containment spray flow

Heat removal by the containment fan heat removal system

Containment atmosphere temperature

Containment sump water temperature

Makeup flow-in

Letdown flow-out

Volume control tank level

Component cooling water temperature to ESF system

Emergency ventilation damper position

Status of standby power and other energy sources important to safety.