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CONFORMANCE TO REGULATORY GUIDE 1.97
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT NO. 1

J. W. Stoffel

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EG&G Idaho, Inc.
Idaho Falls, Idaho 83415

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ABSTRACT

This EG&G Idaho, Inc., report reviews the submittal for Revision 2 of Regulatory Guide 1.97 for Unit No. 1 of the San Onofre Nuclear Generating Station 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.

Docket No. 50-206
TAC No. 51130

FOREWORD

This report is supplied as part of the "Program for Evaluating Licensee/Applicant Conformance to RG 1.97," being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division PWR Licensing-A, by EG&G Idaho, Inc., NRR and I&E Support Branch.

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

Southern California Edison Company, the licensee for Unit No. 1 of the San Onofre Nuclear Generating Station, responded to Section 6.2 of the generic letter with a letter dated December 16, 1985 (Reference 4). This provides a review of the instrumentation provided for Revision 2 of Regulatory Guide 1.97.

This report provides an evaluation of that submittal.

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 installation or upgrade

The submittal should identify any deviations from the recommendations of Regulatory Guide 1.97 and provide supporting justification or alternatives for the deviations identified.

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. Where licensees or applicants explicitly state that their 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 submittal based on the review policy described in the NRC regional meetings.

3. EVALUATION

This evaluation is based on the licensee's response to Generic Letter 82-33 dated November 29, 1985.

3.1 Adherence to Regulatory Guide 1.97

The licensee's submittal for Unit No. 1 of the San Onofre Nuclear Generating Station, compares their post-accident monitoring instrumentation with that recommended by Regulatory Guide 1.97, Revision 2. The licensee states that any open issues involving this instrumentation where strict conformance is not shown will be resolved by May 1987. Therefore, we conclude 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 the 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. Reactor coolant system (RCS) subcooling
2. RCS hot leg water temperature
3. RCS cold leg water temperature
4. Refueling water storage tank level
5. Steam generator level (narrow range)
6. Auxiliary feedwater tank level

7. RCS pressure

8. Pressurizer level

9. Containment pressure

10. Containment sphere level

11. Auxiliary feedwater flow

12. Main steam pressure

13. Containment hydrogen concentration

14. Recirculation flow

This 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 deviations and exceptions from Regulatory Guide 1.97. These are discussed in the following paragraphs.

3.3.1 Items Lacking Licensee Commitment

The consultant for the licensee identified areas where modifications are recommended. However, no commitment has been made by the licensee to complete these modifications. Appendix A identifies these recommendations. The licensee should commit to making the changes and indicate when they will then meet Regulatory Guide 1.97 criteria or provide justification for not completing the upgrades to meet Regulatory Guide 1.97 criteria.

3.3.2 Items Relying on the Fox 3 Computer for Compliance

The licensee has identified variables that meet the regulatory guide recommendations if the Fox 3 computer is acceptable for recording and trend information. The licensee has identified each of these variables as Type A. Therefore, information about these variables are presumably essential for operator action relevant to safety. For "Display and Recording," Regulatory Guide 1.97 states:

> "If direct and immediate trend or transient information is essential for operator information or action, the recording should be continuously available on redundant dedicated recorders."

The licensee should specifically state whether the Fox 3 computer meets the above criteria for each of the variables. If so, the licensee should describe how the criteria are met. If not, the licensee should state (for each variable) why the above criteria does not apply and why the variable is classified as a Type A variable if it is not essential for operator information.

A list of these variables and other information requested about the Fox 3 computer is identified in Appendix B. The licensee should provide the additional information so that a judgment can be made on the acceptability of the Fox 3 computer for these deviations.

3.3.3 Neutron Flux

Regulatory Guide 1.97 specifies environmentally qualified instrumentation for this variable. The instrumentation provided for this variable includes detectors that are not environmentally qualified.

The licensee states that following a design basis accident the reactor can be assumed to be subcritical which could be verified by the difference between the RCS hot leg and cold leg temperatures and by means of the

control rod position lights. In the longer term, RCS grab sampling is adequate for confirming proper boron concentration to ensure that the reactor remains shutdown.

Environmental qualification has been clarified by the Environmental Qualification Rule, 10 CFR 50.49. We conclude that 10 CFR 50.49 has precedence over Regulatory Guide 1.97. The licensee should show that this instrumentation has been addressed in accordance with 10 CFR 50.49.

3.3.4 RCS Soluble Boron Concentrations

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.5 RCS Cold Leg Water Temperature

Regulatory Guide 1.97, Revision 2, recommends instrumentation with a range of 50 to 750°F for this variable. Regulatory Guide 1.97, Revision 3, (Reference 5) changes the recommended range to 50 to 700°F. The licensee states that the existing recorder scale range is 100 to 600°F. This does not meet the recommendation of either regulatory guide revision. The licensee states that the primary function of this variable is to monitor the RCS cooldown rate based on downcomer coolant temperature and that the existing instrument/recorder range is adequate for this purpose.

We find this deviation unacceptable. The licensee should provide the recommended range or show that the provided instrumentation range, exceeds all expected design basis temperatures.

3.3.6 RCS Hot Leg Water Temperature

Regulatory Guide 1.97, Revision 2, recommends instrumentation with a range of 50 to 750°F with recording capability for this variable. The licensee has provided a range of 100 to 700°F. The licensee states that the existing range meets the upper range limit of Regulatory Guide 1.97 Revision 3 (700°F). Since Regulatory Guide 1.97, Revision 3, lowered the upper range recommendation to 700°F, we find the existing upper range acceptable. The licensee further states that RCS temperature monitoring down to 50°F is not necessary since the emergency operating instructions specify actions based on whether or not the hot let temperature has exceeded 680°F. Based on the licensees justification and the availability of an alternative, i.e. the residual heat removal temperature instrumentation that would be used for RCS coolant temperatures less than 100°F, we find the lower end of the range is adequate. The licensee states that the recording requirement is met by the Fox 3 computer. The acceptability of aspects other than range of this instrumentation is based on the additional information requested in Appendix B on the Fox 3 computer and certification by the licensee that the Regulatory Guide 1.97 criteria are met.

3.3.7 RCS Pressure

Regulatory Guide 1.97 recommends instrumentation with a range of 0 to 3000 psig for this variable. In addition the regulatory guide recommends complete separation between redundant channels. The licensee has instrumentation with an indicator range of 1600 to 2400 for this variable. The licensee states that the redundant recorder has a range of 0-3000 psig and the Fox 3 monitors RCS pressure and provides trend information for the 0 to 3000 psig range.

We find this range deviation unacceptable. Regulatory Guide 1.97 states that it is essential that the range be sufficient to keep the instruments on scale. The licensee has not shown that this is the situation for all design basis accident scenarios. Therefore, we cannot

concur with this deviation. The licensee should either show that the supplied range encompasses all anticipated RCS pressures or provide the recommended range.

The licensee states that the instrument loop and power supply cables for this instrumentation are routed in common cable trays and do not meet the physical separation criteria required.

The licensee should commit to modification of the cable routing for this instrumentation to comply with the redundancy recommendations of Regulatory Guide 1.97.

3.3.8 Core Exit Temperature

Regulatory Guide 1.97 recommends that environmentally qualified instrumentation be provided for this variable. The licensee has provided instrumentation with thermocouples that are not verified as environmentally qualified.

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

3.3.9 Recirculation Flow (Safety Injection)

The licensee has designated this flow as a Type A variable, which requires recording capability. The licensee states that trending of recirculation flow rate is not required to assure appropriate operator response.

We find this justification unacceptable for a Type A variable. Regulatory Guide 1.97 does not require this instrumentation to be Type A. The licensee has determined that this instrumentation is Type A. The licensee should provide recording capability for this variable.

3.3.10 Coolant Level in Reactor

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.11 Degrees of Subcooling

Regulatory Guide 1.97 recommends a range of 200°F subcooling to 35°F superheat for this variable. The licensee has provided instrumentation with a range of 150°F subcooling to 50°F superheat. The licensee has not provided recording capability for this variable which has been designated as a Type A variable by the licensee.

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

3.3.12 Containment Sump (Containment Sphere) Water Level

Regulatory Guide 1.97 recommends that the instrumentation for the wide range containment sump level be Category 1, which requires recording capability. The licensee nas not provided recording capability and states that the sphere level trend information may be obtained from the Fox 3 computer.

The acceptability of this instrumentation is based on the additional information requested in Appendix B and the licensee's certification that Regulatory Guide 1.97 criteria are met.

3.3.13 Containment Pressure

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. Thus, recording capability is recommended. The licensee states that wide range containment pressure trend information may be obtained from the Fox 3 computer.

The acceptability of this instrumentation is based on the additional information requested in Appendix B and the licensee's certification that Regulatory Guide 1.97 criteria are met.

3.3.14 Radioactivity Concentration or Radiation Level in Circulating Primary Coolant

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.15 Analysis of Primary Coolant

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.16 Containment Hydrogen Concentration

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. Thus, recording capability is recommended. The licensee has not

provided recording capability and states that the containment hydrogen trend information may be obtained from the Fox 3 computer.

The acceptability of this instrumentation is based on the additional information requested in Appendix B and the licensee's certification that Regulatory Guide 1.97 criteria are met.

3.3.17 Residual Heat Removal (RHR) System Flow

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this variable is required for cold shutdown, but is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.18 RHR Heat Exchanger Outlet Temperature

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this variable is required for cold shutdown, but is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.19 Flow in Low Pressure Injection (LPI) Systems

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this variable is not required for verifying system operation (i.e., valve alignment, pump operation).

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.20 Refueling Water Storage Tank Level

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. However, the licensee has designated this tank level as a Type A variable that requires redundant instrumentation and recording capability. The licensee states that one of the redundant instrument loops provides indication and the other an alarm and input to the Fox 3 computer.

We find this deviation unacceptable for a Type A variable. Regulatory Guide 1.97 does not require this instrumentation to be Type A. The licensee has determined that this instrumentation is Type A. The licensee should provide redundant continuous indication of the tank level. The recording requirement should be met for this instrumentation.

3.3.21 Reactor Coolant Pump Status

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this is not a critical safety function.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.22 Primary System Safety Relief Valve Position

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.23 Pressurizer Heater Status

Regulatory Guide 1.97 recommends the measurement of the heater current to verify heater operation and to prevent overloading the heater power sources. The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.24 Quench Tank Level

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.25 Quench Tank Temperature

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.26 Quench Tank Pressure

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.27 Steam Generator Level (Wide Range)

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable that monitors steam generator level from the tube sheet to the separators. The licensee has identified acceptable narrow range instrumentation, but, states that the wide range instrumentation is not environmentally qualified and the range is not provided.

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737 for the wide range steam generator level.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.28 Safety/Relief Valve Positions or Main Steam Flow

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.29 Main Feedwater Flow

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.30 Auxiliary Feedwater Flow

The licensee has designated this flow instrumentation as a Type A variable, which requires Category 1 instrumentation with qualified redundant channels and recording capability. The licensee states that steam generator wide range level (which will be qualified) is used as the redundant flow instrument and the Fox 3 will provide the flow trend information.

We find that the upgraded wide range steam generator level instrumentation is adequate to meet the redundancy requirement; however, the licensee should confirm that the emergency operating procedures provide for this alternate measurement. The recording requirement is based on the additional information requested in Appendix B and the licensee's certification that Regulatory Guide 1.97 criteria are met.

3.3.31 Condensate Storage Tank (Auxiliary Feedwater Tank) Level

Regulatory Guide 1.97 recommends the instrumentation for this variable to be Category 1, which requires recording capability. The licensee states that adequate auxiliary feedwater tank level trend information may be obtained from the Fox 3.

The acceptability of this instrumentation is based on the additional information requested in Appendix B and the licensee's certification that Regulatory Guide 1.97 criteria are met.

3.3.32 Containment Spray Flow

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required for verifying system operation.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.33 Containment Atmosphere Temperature

Regulatory Guide 1.97 recommends Category 2 instrumentation with a range of 40 to 400°F to monitor this variable. The licensee states that this instrumentation does not exist and is not required in response to accident conditions.

This justification is not acceptable. The licensee should either provide the recommended instrumentation or show an alternate means of determining this temperature.

3.3.34 Containment Sump Water Temperature

Regulatory Guide 1.97 recommends Category 2 instrumentation with a range of 50 to 250°F to monitor this variable. The licensee states that this instrumentation does not exist and is not required in response to accident conditions.

This justification is not acceptable. The licensee should provide recommended instrumentation for the functions outlined in Regulatory Guide 1.97 or identify other instruments that provide the same information (such as the RHR heat exchanger inlet temperature) and satisfy the Category 2 requirements of the regulatory guide that will allow a quantitative look at the operation of the heat removal from the containment sump.

3.3.35 Makeup Flow-In

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

NUREG-1190, Section 4.9 (Reference 6), states that the chemical and volume control system is a safety-related auxiliary system with post-accident functions. Therefore, the licensee should provide Category 2 instrumentation with the recommended range for this variable.

3.3.36 Letdown Flow-Out

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

NUREG-1190, Section 4.9, states that the chemical and volume control system is a safety-related auxiliary system with post-accident functions. Therefore, the licensee should provide Category 2 instrumentation with the recommended range for this variable.

3.3.37 Volume Control Tank Level

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

NUREG-1190, Section 4.9, states that the chemical and volume control system is a safety-related auxiliary system with post-accident functions. Therefore, the licensee should provide Category 2 instrumentation with the recommended range for this variable.

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

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.39 CCW Flow to ECF System

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.40 High-Level Radioactive Liquid Tank Level

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.41 Radioactive Gas Holdup Tank Pressure

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.42 Emergency Ventilation Damper Position

Regulatory Guide 1.97 recommends Category 2 instrumentation to monitor the damper status. The licensee states that this indication has not been provided.

This is not acceptable. The licensee should either install the recommended instrumentation or show the existence of an alternate means of determining the emergency ventilation damper position.

3.3.43 Status of Standby Power and Other Energy Sources

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not required in response to accident conditions.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.44 Radiation Exposure Rate (Inside Buildings--)

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this is not a critical function.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.45 Vent From Steam Generator Safety Relief Valves or Atmospheric Dump Valves

Regulatory Guide 1.97 recommends a range of 10^{-1} to 10^{3} μCi/CC for this variable. The licensee has provided dose rate instrumentation with a range of 10^{-4} to 10^{4} R/hr in conjunction with auxiliary feedwater flow (or steam flow) for determination of release magnitude.

The existing range for this variable is not in the same units as recommended by Regulatory Guide 1.97. However, the existing instrumentation is adequate to provide the necessary accident and post-accident information. Therefore, this is an acceptable deviation from Regulatory Guide 1.97.

3.3.46 Airborne Radiohalogens and Particulates (portable sampling with onsite analysis capability)

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.47 Plant and Environs Radiation (portable instrumentation)

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not needed to assess offsite doses.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.48 Plant and Environs Radioactivity (portable instrumentation)

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737. The licensee states that this instrumentation is not needed to assess offsite doses.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

3.3.49 Accident Sampling (primary coolant, containment air and sump)

The licensee has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737.

The licensee should provide the required information, identify any deviation from Regulatory Guide 1.97 and provide supporting justification or alternatives for those deviations.

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. Items lacking licensee commitment--The licensee should either commit to their consultants recommendations (Appendix A) or provide justification for not completing them (Section 3.3.1).

2. Items relying on the Fox 3 computer--The licensee should provide the information requested in Appendix B so a conclusion can be reached on the acceptability of the variables listed (Section 3.3.2).

3. Neutron flux--Environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.3).

4. RCS soluble boron concentration--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.4).

5. RCS cold leg water temperature--the licensee should provide the recommended range or show that the existing or alternate instrumentation range will not be exceeded post-accident (Section 3.3.5).

6. RCS hot leg water temperature--the licensee should provide the information requested by Appendix B to determine the acceptability of this variable (Section 3.3.6).

7. RCS pressure--the licensee should show that the existing range will cover all anticipated RCS pressures or provide the recommended range. The licensee should commit to the cable routing modifications that are necessary for redundancy compliance (3.3.7).

8. Recirculation flow--The licensee should provide recording capability for this variable (Section 3.3.9).

9. Coolant level in reactor--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.9).

10. Containment sump (containment sphere) water level--the licensee should provide the information requested by Appendix B to determine the acceptability of this variable (Section 3.3.12).

11. Containment pressure--the licensee should provide the information requested by Appendix B to determine the acceptability of this variable (Section 3.3.13).

12. Radioactivity concentration or radiation level in circulating primary coolant--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.14).

13. Analysis of primary coolant--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.15).

14. Containment hydrogen concentration--the licensee should provide the information requested by Appendix B to determine the acceptability of this variable (Section 3.3.16).

15. RHR system flow--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.17).

16. RHR heat exchanger outlet temperature--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.18).

17. Flow in LPI system--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.19).

18. Refueling water storage tank level--the licensee should provide redundant continuous indication for this variable with recording capability (Section 3.3.20).

19. Reactor coolant pump status--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.21).

20. Primary system safety relief valve position--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.22).

21. Pressurizer heater status--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.23).

22. Quench tank level--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.24).

23. Quench tank temperature--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.25).

24. Quench tank pressure--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.26).

25. Steam generator level (wide range)--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.27).

26. Safety relief valve position or main steam flow--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.28).

27. Main feedwater flow--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.29).

28. Auxiliary feedwater flow--the licensee should provide additional information on the instrumentation for this variable (Section 3.3.30).

29. Condensate storage tank (auxiliary feedwater) level--the licensee should provide the information requested by Appendix B to determine the acceptability of this variable (Section 3.3.31).

30. Containment spray flow--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.32).

31. Containment atmosphere temperature--the licensee should provide this instrumentation or identify an alternate means of determining this temperature (Section 3.3.33).

32. Containment sump water temperature--the licensee should provide this instrumentation or identify alternate means of determining this temperature (Section 3.3.34).

33. Makeup flow-in--the licensee should provide Category 2 instrumentation with the recommended range for the variable (Section 3.3.35).

34. Letdown flow-out--the licensee should provide Category 2 instrumentation with the recommended range for this variable (Section 3.3.36).

35. Volume control tank level--the licensee should provide Category 2 instrumentation with the recommended range for this variable (Section 3.3.37).

36. CCW temperature to ESF system--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.38).

37. CCW flow to ESF system--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.39).

38. High-level radioactive liquid tank level--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.40).

39. Radioactive gas holdup tank pressure--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.41).

40. Emergency ventilation damper position--the licensee should provide Category 2 instrumentation for this variable or identify alternate means of determining damper position (Section 3.3.42).

41. Status of standby power and other energy sources--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.43).

42. Radiation exposure rate--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.44).

43. Airborne radiohalogens and particulates--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.46).

44. Plant and environs radiation--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.47).

45. Plant and environs radioactivity--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.48).

46. Accident sampling (primary coolant, containment air, and sump--the licensee should provide information on the instrumentation for this variable, identify any deviations and justify any deviations identified (Section 3.3.49).

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, 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. Southern California Edison Company letter M. O. Medford to Director of Nuclear Reactor Regulation, NRC, "Regulatory Guide 1.97 Review," December 16, 1985.

5. 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.

6. Loss of Power and Water Hammer Event at San Onofre, Unit 1, on November 21, 1985, NUREG-1190, January 1986.

APPENDIX A

1. Neutron flux - cabling upgrade

2. RCS cold leg water temperature - upgrade the power supply

3. RCS pressure - upgrade the power supply

4. Auxiliary feedwater flow - environmentally qualify steam generator wide range level transmitters

5. Auxiliary feedwater tank level - upgrade the power supply

6. Recirculation flow - provide redundant, environmentally qualified instrumentation

7. Main steam pressure - provide environmental qualification with adequate range and uninterruptable power supply

8. Containment isolation valve position - environmentally qualify the listed position switches

9. Pressurizer level - upgrade the power supply

APPENDIX B

Regulatory Guide 1.97 recommends continuous real-time display of Category 1 variables. If direct and immediate trend or transient information is essential for operator information or action, a recording should be continuously available on redundant dedicated recorders. Presumably, Class A variables should meet these criteria.

The licensee classifies the following as Type A variables.

1. RCS hot leg water temperature

2. Containment sump (containment sphere) water level

3. Containment pressure

4. Containment hydrogen concentration

5. Refueling water storage tank level

6. Auxiliary feedwater flow

7. Condensate storage tank (auxiliary feedwater tank) level

The licensee states that trending information and recording can be accomplished by the Fox 3 computer for the above variables.

The licensee should provide additional information on the Fox 3 computer. For example: why can't dedicated recorders be used?; Are the displays dedicated to the real-time display of Category 1 variables?; How many displays are there?; Are the displays redundant?; How many variables are displayed at one time?; and address the reliability of the variables displayed (human factors). In particular, how does the Fox 3 computer meet the continuous real-time display and redundant dedicated recorder criteria for Type A variables?

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This EG&G Idaho, Inc. report reviews the submittal for the San Onofre Nuclear Generating Station, Unit No. 1, and identifies areas of nonconformance to Regulatory Guide 1.97. Exceptions to these guidelines are evaluated and those areas where sufficient basis for acceptability is not provided are identified.

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