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CONFORMANCE TO REGULATORY GUIDE 1.97, SAN ONOFRE NUCLEAR GENERATING STATION UNIT NOS. 2 AND 3

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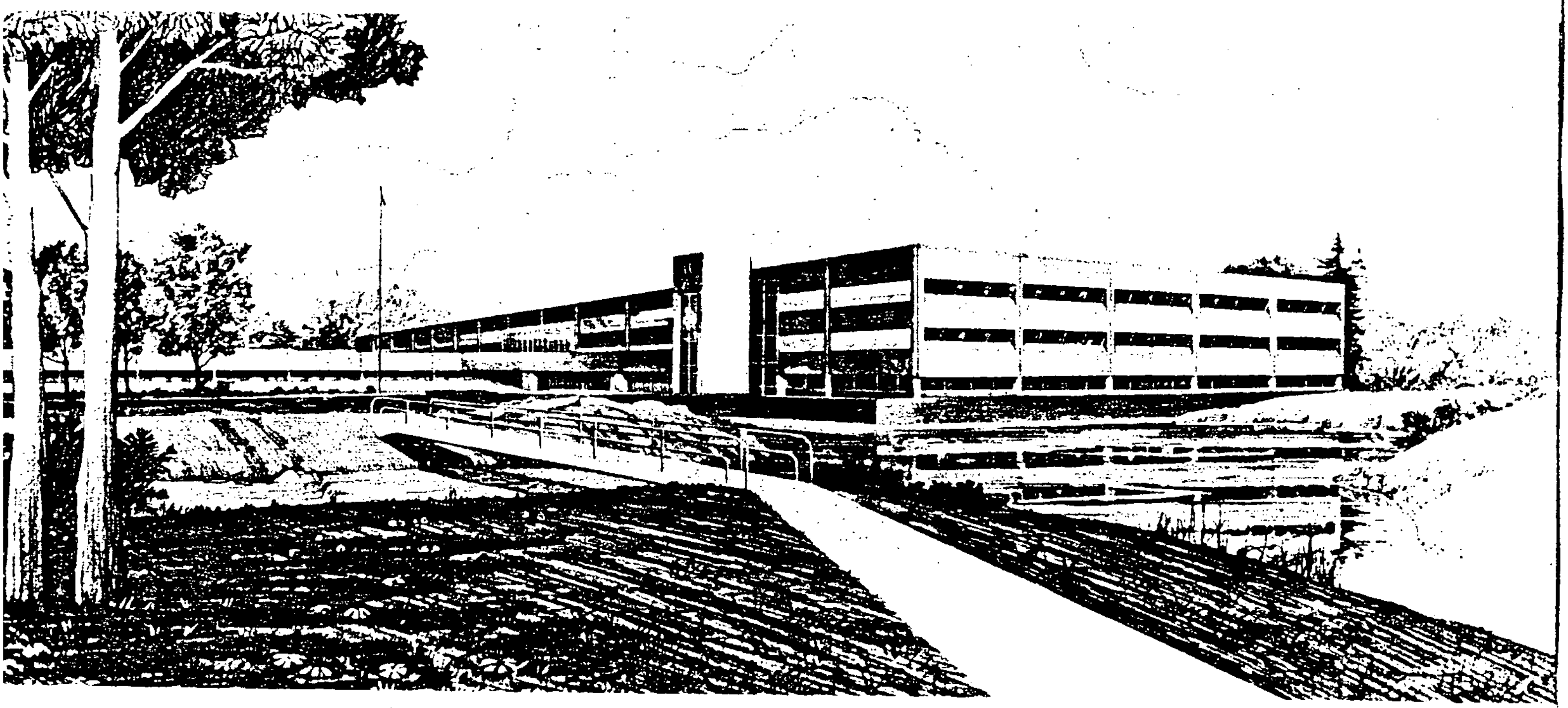
Operated by the U.S. Department of Energy



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EG&G Idaho

CONFORMANCE TO REGULATORY GUIDE 1.97
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT NOS. 2 AND 3

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ABSTRACT

This EG&G Idaho, Inc., report reviews the submittals for San Onofre Unit Nos. 2 and 3, and identifies areas of full conformance to Regulatory Guide 1.97, Revision 2. Any exception to these guidelines 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 RG 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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CONTENTS

CONFORMANCE TO REGULATORY GUIDE 1.97
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT NOS. 2 AND 3

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).

Southern California Edison Company (SCE), the licensee for San Onofre Nuclear Generating Station, Unit Nos. 2 and 3, provided a response to the Regulatory Guide 1.97, Revision 2, on May 13, 1982 (Reference 4). Additional information was provided on July 26, 1984 (Reference 5).

This interim 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 NRC describing how the applicant 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
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 evaluates the exceptions to the guidance of 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

The licensee provided a response to the NRC generic letter 82-33 on May 13, 1982, and additional information on July 26, 1984. This evaluation is based on these submittals.

3.1 Adherence to Regulatory Guide 1.97

The licensee states that the existing and planned plant instrumentation is consistent with Regulatory Guide 1.97, Revision 2, except for the deviations identified in Section III of Reference 4. Therefore, it is concluded that the licensee has provided an explicit commitment on conformance to the guidance of the regulatory guide, except for those exceptions that were justified as noted in Subsection 3.3.

3.2 Type A Variables

In that 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 classified the following instrumentation channels as Type A variables.

1. Neutron flux

2. Reactor coolant system (RCS) hot leg water temperature

3. RCS cold leg water temperature

4. RCS pressure

5. Refueling water storage tank level

6. Containment pressure

7. Containment sump water level

8. Containment hydrogen concentration

9. Coolant level in reactor (reactor vessel level monitoring system)

10. High pressure safety injection flow

11. Core exit temperature (thermocouples)

12. Steam generator level

13. Steam generator pressure.

All the above variables are also included as type B, C or D variables, and meet Category 1 requirements consistent with the requirements for Type A variables except for neutron flux. The licensee has committed to replace the neutron flux instruments with qualified instruments in accordance with 10 CFR 50.49.

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 Pressure

This instrumentation complies with the Category 1 requirements. The range of the instrumentation is not as recommended by Regulatory Guide 1.97 (0 to 4000 psig). The instrumentation provided covers a range of 0 to 3000 psig. The licensee's justification for this deviation is that this range is adequate pending resolution of the anticipated transient without scram (ATWS) issue.

The existing range of 0-3000 psig is adequate to monitor all expected pressures based on the accident analyses presented in Chapter 15 of the plant FSAR. The licensee has made a commitment to either upgrade or

install new Category 1 instrumentation for this variable if required in accordance with resolution of the ATWS issue. Therefore, this is an acceptable deviation from Regulatory Guide 1.97.

3.3.2 Reactor Coolant System Hot and Cold Leg Water Temperature

The instrumentation provided for this variable has a range of 50°F to 710°F rather than 50°F to 750°F as recommended by Regulatory Guide 1.97, Revision 2.

Regulatory Guide 1.97, Revision 3, May 1983, recommends a range of 50°F to 700°F for these variables. The instrumentation supplied by the licensee exceeds this recommended range and therefore is acceptable.

3.3.3 Accumulator Tank Level and Pressure

Pressure

The licensee takes exception to the pressure range recommended by Regulatory Guide 1.97, Revision 2 (0 to 750 psig). The provided instrumentation has a range of 0 to 700 psig. The licensee states that this meets the intent. The licensee's technical specifications (Section 16.3.5.1.1), requires a nitrogen cover pressure of between 600 and 610 psig. This pressure is manually controlled. The existing range of 0-700 psig is an acceptable deviation for these units because it adequately covers the expected range of accumulator pressure.

Level and Pressure (Environmental Qualification)

The licensee states that environmental qualification upgrade is not warranted for the level and pressure instrumentation and submitted the following justification for this deviation. "The existing instruments for accumulator tank (SIT) level and pressure are not environmentally qualified. However, these instruments are provided only to maintain the SITs within the Technical Specfication Limiting Conditions for Operation so as to maintain readiness of the Emergency Core Cooling system (ECCS) for

mitigating postulated loss-of-coolant accidents (LOCA's); these functions are not required to monitor SIT performance during a LOCA. SIT performance during a LOCA is monitored by the qualified, safety related instruments for pressurizer (RCS) pressure and inadequate core cooling (ICC). Because the SIT's are a passive subsystem of the ECCS, any pressurizer pressure Specifications (600 psig) guarantees that the SIT's are performing their safety function. Observation of ICC instrumentation for reactor vessel level provides an independent means for verifying post-accident performance of the ECCS. Consequently, environmental qualification of the SIT level and pressure instruments is not required."

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 10 CFR 50.49.

3.3.4 Steam Generator Pressure

The licensee has provided instrumentation for this variable with a range of 0 to 1200 psia. The recommended range is from atmospheric pressure to 20% above the lowest safety valve setting. The lowest safety valve setting is 1100 psia (Technical Specification Table 16.4-15). This requires a range of 1317 psia to meet the Regulatory Guide 1.97 recommendation. The licensee's justification for this deviation is that "an exception was requested based on the existing instrument range of 0 to 1200 psia meeting the intent of the recommendation by bounding the range of events analyzed in the FSAR (worst case 1154 psia)."

The San Onofre Unit Nos. 2 and 3 Final Safety Analysis Report, Figure 5.2 A-1 (Reference 6) shows a maximum anticipated steam generator pressure of 1154 psia. This analysis assumes a complete loss of turbine generator load, a reactor trip on high pressurizer pressure, and operation of the safety valves within their specifications. Consequently, actual peak secondary-side pressures will not exceed the 1154 psia maximum stated

in the FSAR with the possible exception of ATWS. If an instrument range greater than 0 to 1200 psia is required in accordance with resolution of the ATWS issue the licensee has committed to either upgrade or install new Category 2 instruments to provide the required range. Therefore, this is an acceptable deviation from Regulatory Guide 1.97.

3.3.5 Containment Sump Water Temperature

Regulatory Guide 1.97 recommends that the containment sump water temperature be measured for a range of 50 to 250°F.

The licensee does not believe that it is necessary to install an instrument to read this variable. The licensee states that there is no defined need for this information; that operation of the containment cooling system is monitored most directly by the qualified, safety-grade containment pressure and temperature instruments. In addition the RHR heat exchanger outlet temperature provides a direct measure of containment cooling system performance. Further, saturated conditions were assumed for the sump in designing for adequate NPSH to safeguard pumps.

We concur with the licensee and find this an acceptable deviation from Regulatory Guide 1.97.

3.3.6 Component Cooling Water (CCW) Temperature to ESF System

The licensee takes exception to the range recommended by Regulatory Guide 1.97 (32°F to 200°F). He states that the existing instrumentation with the high range to 150°F meets the intent of Regulatory Guide 1.97. The maximum CCW temperature, with concurrent maximum system heat load and maximum heat sink temperature is 105°F, per FSAR Section 9.2.2.2.1. This ensures at least 30% margin to the upper limit of the indicated range. Therefore, the existing range is adequate and this is an acceptable deviation from Regulatory Guide 1.97.

3.3.7 Reactor Coolant System Soluble Boron Concentration

The licensee does not propose to change the existing boron concentration range (10 to 5000 ppm) to the recommended range (0 to 6000 ppm). The licensee states that the existing instrumentation meets the intent of Regulatory Guide 1.97. He further mentions that boron measurement can be obtained by grab samples. The licensee has shown analysis that indicates a worst case maximum boron concentration in the RCS to be no greater than 3950 ppm.

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

3.3.8 Quench Tank Temperature

The licensee takes exception to the temperature range recommended by the regulatory guide (50°F to 750°F). The installed instrumentation has a range of 0 to 300°F. The justification presented by the licensee for this deviation is that for the largest pressurizer safety valve release due to any single analyzed accident, (other than ATWS or failure-open of a safety valve), the resultant temperature in the tank will not exceed 223°F. ATWS or failure-open of a safety valve is considered to fail the quench tank blowing the rupture disk and no longer requiring temperature monitoring of the tank.

We consider this justification adequate. Therefore, this is an acceptable deviation from Regulatory Guide 1.97.

3.3.9 Main Feedwater Flow

The licensee's existing instrumentation covers a range up to 8.0×10^6 lb/hr, which is 105% of design flow. Regulatory Guide 1.97 recommends a range of 110% of design flow, which would require up to 8.3×10^6 lb/hr. The only justification for this deviation given by the licensee is that the existing instrumentation meets the intent.

We find this small deviation in the range requirement to be acceptable for this instrumentation. The existing range is adequate to monitor this variable during accident and post-accident conditions. Therefore, this an acceptable deviation from Regulatory Guide 1.97.

3.3.10 Radioactive Gas Holdup Tank Pressure

Regulatory Guide 1.97 recommends a range of 0 to 150% of design pressure for this instrumentation. The licensee has supplied instrumentation for this variable with a range of 0 to 400 psig, which is 114% of the design pressure of the vessel. The licensee's justification for this deviation is that a safety valve on the tank lifts at 350 psig, preventing the design pressure of 350 psig from being exceeded.

Per Regulatory Guide 1.97, the purpose of this instrumentation is to indicate storage capacity. The operating range of the instrumentation covers not only this operating range but also the safety valve lift pressure. Therefore, we find the deviation acceptable.

3.3.11 Quench Tank Level

The licensee takes exception to the top to bottom range recommended by Regulatory Guide 1.97. The supplied instrumentation covers a span of 60 in. between instrument taps and is calibrated for 0 to 100% indication. The licensee's justification for this deviation is that the actual range from 3.4% to 96.6% is sufficient to monitor the level increase resulting from all analyzed accidents which cause safety valve releases.

The provided instrumentation will monitor the tank level for all analyzed accidents except ATWS and failure-open of a safety valve. For these events the quench tank will fail and the rupture disc will blow. Monitoring of the quench tank operation is not required under these circumstances. Therefore, this an acceptable deviation from Regulatory Guide 1.97.

3.3.11 Radiation Exposure Rate

The licensee takes exception to the instrument range recommended by Regulatory Guide 1.97 (10^{-1} R/hr to 10^{4} R/hr). Currently installed area radiation monitors cover the range of 10^{-1} to 10^{4} mrem/hr. The licensee's justification for this deviation is that this range is adequate to determine if a specific area is accessible, based on the analysis done for TMI NUREG 0737 Item II.B.2., and that area monitors can be augmented by local portable monitors.

From a radiological standpoint~~, if~~ the radiation levels reach or exceed the upper limit of the range (10 R/hr), personnel would not be permitted access to the areas except for life saving. We therefore find the proposed range (10^{-1} to 10^{4} mrem/hr) for the radiation exposure rate monitors acceptable.

3.3.13 Radioactivity Concentration or Radiation Level in Circulating Primary Coolant

The licensee does not consider this continuous measurement to be necessary. The justification given by the licensee is that detection of breach information is currently provided by three alternative means: the letdown system process monitor, containment area monitors and sampling/analysis. "Consequently, RCS activity is measured by existing instrumentation in a manner already in excess of valid post-accident monitoring requirements and SCE does not commit to evaluate or install additional instruments for this parameter."

We concur with the justification submitted by the licensee for this deviation. Their existing instrumentation is adequate to monitor post accident reactor coolant activity. Further, a continuous post accident reactor coolant activity monitor is not a requirement of NUREG-0737. Therefore, this is an acceptable deviation from Regulatory Guide 1.97.

3.3.14 Chemical and Volume Control System Letdown Flow-Out

The licensee states that environmental qualification of this instrumentation is not required and submitted the following justification for this deviation: "The existing instrumentation for this function is Category 3, but is supplied from a reliable power source (UPS). Letdown is automatically isolated during a LOCA (via CIAS and SIAS) and would not be manually restored via overrides with RCS activity levels in excess of the letdown system design with respect to fraction of failed fuel. In addition, the Category 2 pressurizer level and charging pump flow instruments could be used to determine letdown."

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 10 CFR 50.49.

3.3.15 Accident Sampling Capability (Analysis Capability on Site)

The licensee takes exception to providing on-site analysis capability for chloride. The licensee's justification is that offsite analysis capability exists using post-accident sampling system grab samples. Regulatory Guide 1.97 recommended time for taking and analyzing chloride samples is within 24 hours. The licensee submitted the following justification for this deviation: "An agreement has been made with General Atomic (Torrey Pines Technology), which is located approximately 1 hour south of the plant on Interstate 5 (in La Jolla) to perform this analysis. The turn-around time from sample to analysis results will be well within the 24 hour recommended time limit."

We consider this method of chloride monitoring adequate. Therefore, this an acceptable deviation from Regulatory Guide 1.97.

4. CONCLUSIONS

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

1. Accumulator Tank Level and Pressure--Environmental qualification needs to be addressed in accordance with 10 CFR 50.49 (see Subsection 3.3.3).

2. Chemical and Volume Control Letdown Flow-Out--Environmental qualification needs to be addressed in accordance with 10 CFR 50.49 (See Subsection 3.3.14).

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. Southern California Edison Company letter, K. P. Baskin to Director, Office of Nuclear Reactor Regulation, May 13, 1982.

5. Southern California Edison Company letter, M. O. Medford to Director, Office of Nuclear Reactor Regulation, July 26, 1984.

6. Final Safety Analysis Report, San Onofre Nuclear Generating Station, Units 2 and 3, revised through Amendment 12, dated October, 1978.

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This EG&G Idaho, Inc. report reviews the submittals for the San Onofre Nuclear Generating Station, Unit Nos. 2 and 3, and identifies areas of conformance to Regulatory Guide 1.97, Revision 2. Any exception to these guidelines are evaluated.

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