

CONFORMANCE TO REGULATORY GUIDE 1.97
SURRY POWER STATION, UNIT NOS. 1 AND 2

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Published January 1985

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Prepared for the
U.S. Department of Energy
Idaho Operations Office
Under DOE Contract No. DE-AC07-76ID01570
FIN No. A6483

8502050389 #2

ABSTRACT

This EG&G Idaho, Inc., report provides a review of the Surry Power Station, Unit Nos. 1 and 2, submittal for Regulatory Guide 1.97 and identifies areas of nonconformance to the guide. Any exceptions to the guidelines are evaluated and those areas where sufficient basis for acceptability is not provided are identified.

FORWARD

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.

The U.S. Nuclear Regulatory Commission funded the work under authorization B8R20-19-10-11-3.

Docket Nos. 50-280 and 50-281

TAC Nos. 51138 and 51139

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1. INTRODUCTION

On December 17, 1983, 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).

Virginia Electric and Power Company, the licensee for Surry Power Station, Unit Nos. 1 and 2, provided a response to the Regulatory Guide 1.97 portion of the generic Letter on January 31, 1984 (Reference 4).

This report provides an evaluation of that submittal.

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 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
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 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 the NRC generic letter 82-33 on January 31, 1984. This evaluation is based on that submittal.

3.1 Adherence to Regulatory Guide 1.97

The licensee stated that based on the information presented in their submittal, the Surry Power Station, Unit Nos. 1 and 2, will conform with the recommendations of Regulatory Guide 1.97, Revision 3 (Reference 5), by the end of the second refueling after July 1985. Therefore, it is concluded that the licensee has provided an explicit commitment on conformance to the guidance of Regulatory Guide 1.97. Exceptions to the regulatory guide are noted below.

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 variables.

1. Steam generator narrow range level
2. Steam generator pressure
3. Core exit temperature
4. Reactor Coolant System (RCS) cold leg water temperature
5. RCS hot leg water temperature
6. RCS flow

7. RCS wide range pressure
8. High Pressure Safety Injection (HPSI) flow
9. Condensate storage tank water level
10. Refueling water storage tank level
11. Power Operated Relief Valve (PORV) position indication
12. Pressurizer liquid temperature
13. Pressurizer level
14. Containment hydrogen concentration
15. Containment intermediate range pressure

All of the above variables except RCS flow and pressurizer liquid temperature are also included as Type B, C, and D variables. They meet Category 1 requirements consistent with the requirements for Type A variables except as noted in Section 3.3. RCS flow does not meet Category 1 requirements. The instrumentation for RCS flow does not meet the environmental or seismic qualification recommendations for Category 1. The licensee supplied the following justification. "Parameter is confirmatory in nature only (running/not running), therefore we do not intend to upgrade. As a backup, item D-10 Reactor Coolant Pump current indication and RCP breaker status (open/closed) is available to the operator for each motor."

This is insufficient justification for this deviation. As RCS flow has been identified by the licensee as providing information required to permit manual controlled actions that are necessary to the functioning of safety systems in design basis events, the licensee should upgrade this instrumentation to Category 1 requirements.

3.3 Exceptions to Regulatory Guide 1.97

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

3.3.1 RCS Pressure

The licensee takes exception to the environmental and seismic qualification recommended by Regulatory Guide 1.97 for this variable. No justification was submitted for this deviation.

The licensee should provide Category 1 instrumentation for this variable.

3.3.2 Radioactivity Concentration or Radiation Level in Circulating Primary Coolant

The licensee states that two independent and redundant systems are available to obtain this sample. The Post Accident System is one of the systems to be used for this variable. The other system is stated to be fully environmentally and seismically qualified; however, this instrumentation is not identified.

The licensee should provide the information required by Section 6.2 of NUREG-0737, Supplement No. 1 for this variable.

3.3.3 RHR System Flow

RHR Heat Exchanger Outlet Temperature

The licensee takes exception to the environmental qualification recommended for these variables by Regulatory Guide 1.97 (Category 2). The following justification for this deviation was submitted by the licensee. "The RHR system is not required to operate during post accident conditions as identified in the updated Final Safety Analysis Report Section 9.3.2.2.

Additionally, RHR flow and temperature are backup variables for monitoring core cooling which can be determined from redundant and qualified temperature and pressure measurements."

We concur with the licensee that with their station design this instrumentation is not required post-accident. However, during an accident the RHR system does operate and must be manually shutdown. Therefore, this instrumentation is needed to monitor proper operation of the RHR system. Environmental qualification is the only deviation from Category 2 requirements identified. 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 Accumulator Tank Level and Pressure Accumulator Isolation Valve Position

The licensee takes exception to the level range for the accumulator tank and the environmental qualification for the level, pressure and isolation valve position instrumentation for these variables. Regulatory Guide 1.97 recommends a level range of 10 to 90 percent for the accumulator tank. A narrow level range of 12 inches is provided by the licensee. No environmental qualification was provided for these instruments. Environmental Qualification is recommended by Regulatory Guide 1.97. The licensee states that the present accumulator tank level instrumentation range of twelve inches is required to obtain the accuracy needed to meet technical specification conditions and meet the intent of Regulatory Guide 1.97. The transmitter and position switches are located below the flood plane after a accident and "environmentally qualified only for the environment that they see during normal plant operations. During power operations, the power to the accumulator isolation valve, which is open, is removed with the breaker being verified locked open by Technical Specification during start-up procedure. Therefore, accumulator pressure, level and valve position indication serve as a means to determine accumulator status during normal operations and to ensure their capability to

perform their automatic accident function which is independent of electrical signals and strictly mechanical in nature."

The technical specifications provide the limiting conditions for operation and surveillance requirements for system variables (levels, temperature, etc.) that are required to be operational and available for pre-accident conditions. The technical specifications do not identify specific instrumentation ranges that must be available in post-accident conditions. The licensee should show that the accumulator level instrumentation will adequately cover the maximum expected range or provide instrumentation with the range recommended by Regulatory Guide 1.97.

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.

3.3.5 Pressurizer Level

Regulatory Guide 1.97 recommends redundant Category 1 instrumentation for this variable with a range from top to bottom. The licensee does not have redundant instrumentation. They are adding "density compensation to reduce the error and expand the range of the transmitter to the full range allowed by taps." The "present instrumentation covers 390 in. of the 500 in. height of the pressurizer with only the curvature portions of the vessel not being covered." The licensee has not provided justification for the lack of redundancy for this instrumentation.

The instrumentation provided for this variable does not indicate the volume in the hemispherical ends of the vessel. The level indication is provided for the cylindrical portion of the pressurizer. We find that this deviation is acceptable.

The licensee should provide a redundant channel of instrumentation.

3.3.6 Pressurizer Heater Status

Regulatory Guide 1.97 recommends monitoring the pressurizer heater electric current with Category 2 instrumentation. The licensee monitors the heater circuit breaker position. The licensee states that this instrumentation is adequate.

Section II.E.3.1 of NUREG-0737 requires a number of the pressurizer heaters to have the capability of being powered by the emergency power sources. Instrumentation is to be provided to prevent overloading a diesel-generator. Also, technical specifications are to be changed accordingly. The Standard Technical Specifications, Section 4.4.3.2, requires that the emergency pressurizer heater current be measured quarterly. These heaters, as required by NUREG-0737, should have the current instrumentation recommended by Regulatory Guide 1.97.

3.3.7 Quench Tank Temperature

The licensee has instrumentation installed for this variable that indicates 0 to 350°F. Regulatory Guide 1.97 recommends 50°F to 750°F. The licensee submitted the following justification for this deviation. "The quench tank design pressure is 100 psig. Prior to attaining this pressure, the tank rupture disk will provide a relief path to the containment atmosphere. Therefore, any relief from the pressurizer safety valves will be maintained below 100 psig and a corresponding saturation temperature less than 350°F."

We find the licensee's justification for this deviation acceptable.

3.3.8 Containment Spray Flow

The instrumentation for this variable is not Category 2. The licensee submitted the following justification. "A pressure switch (now a flow switch)

is installed on the discharge side of each Containment Spray Pump to monitor low pressure with annunciator alarm available in the control room."

A pump discharge pressure switch is not adequate to monitor the operation of the containment spray system. The licensee should commit to install instrumentation for this variable that meets the Regulatory Guide 1.97 recommendations.

3.3.9 Containment Sump Water Temperature

The licensee takes exception to the environmental qualification recommended by Regulatory Guide 1.97 for this variable. The licensee states that "the containment sump temperature indication is not required based on the regulatory position delineated in Safety Guide 1 'Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal System Pumps.'" Vepco's Emergency Core Cooling and Containment Heat Removal pumps which take suction from the containment sump when the refueling water storage tank is empty were designed assuming saturated water conditions in meeting the NPSH requirements and in meeting the criteria of Safety Guide 1. Vepco considers this a Category 3 variable."

Environmental qualification is the only deviation from Category 2 requirements identified. 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.

3.3.10 Volume Control Tank Level

The licensee has provided instrumentation for this variable that does not meet the top to bottom range recommended by Regulatory Guide 1.97. The instrumentation provided for this variable does not indicate the volume in the hemispherical ends of the vessel. The level indication is provided for the

cylindrical portion of the volume control tank. We find this deviation acceptable.

3.3.11 Component Cooling Water Temperature to ESF System
Component Cooling Water Flow to ESF System

Regulatory Guide 1.97 recommends Category 2 instrumentation for these variables. The licensee's submittal states that the range, environmental qualification and power source recommendations are not met. The licensee indicated that a temperature channel and a flow channel will be installed to monitor the charging pump cooling system.

The licensee should commit to install Category 2 instrumentation for these variables with the recommended ranges.

3.3.12 Emergency Ventilation Damper Position

The licensee stated that they will install limit switches for this variable. However, we are unable to determine from the licensee's submittal that the range and environmental qualification recommendations will be met. The licensee stated that they will install limit switches.

The licensee should verify that the upgraded instrumentation will meet the Category 2 requirements for this control room display of open-closed status.

3.3.13 Status of Standby Power and Other Energy Sources Important to
Safety

Regulatory Guide 1.97 recommends a plant specific range and Category 2 environmental qualification for these variables. The licensee has identified a range and environmental qualification deviation for the 480 volt emergency buses. No justification was provided for these deviations by the licensee.

The licensee should commit to the installation of instrumentation for the 480 volt emergency buses that conforms to the regulatory guide recommendations.

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.

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. RCS flow--the licensee should upgrade this instrumentation to Category 1 requirements (Section 3.2).
2. RCS pressure--the licensee should install Category 1 instrumentation for this variable (Section 3.3.1).
3. Radiation level in circulating primary coolant--the licensee should provide the information required by Section 6.2 of NUREG-0737, Supplement No. 1 for this variable (Section 3.3.2).
4. RHR system flow--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.3).
5. RHR heat exchanger outlet temperature--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.3).
6. Accumulator tank level--the licensee should install Category 2 instrumentation with the recommended range; environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.4).
7. Accumulator isolation valve position--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.4).
8. Pressurizer level--the licensee should provide a redundant channel of instrumentation (Section 3.3.5).
9. Pressurizer heater status--the licensee should provide the recommended instrumentation for this variable (Section 3.3.6).

10. Containment spray flow--the licensee should install Category 2 spray flow instrumentation with a range in accordance with Regulatory Guide 1.97 (Section 3.3.8).
11. Containment sump water temperature--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.9).
12. Component cooling water temperature to ESF system--the licensee should install Category 2 instrumentation for this variable (Section 3.3.11).
13. Component cooling water flow to ESF system--the licensee should install Category 2 instrumentation for this variable (Section 3.3.11).
14. Emergency ventilation damper position--the licensee should verify that Category 2 instrumentation is being installed for the control room display of this variable (Section 3.3.12).
15. Status of standby power and other energy sources important to safety (480V buses)--the licensee should install instrumentation that meets the recommendations of Regulatory Guide 1.97; environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.13).

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 Plants 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. Virginia Electric and Power Company letter, W. L. Stewart to H. R. Denton, NRC, "Compliance with Regulatory Guide 1.97," January 31, 1984, Serial No. 053.
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, U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Regulatory Research, May 1983.