CONFORMANCE TO REGULATORY GUIDE 1.97
R. E. GINNA NUCLEAR POWER PLANT

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ABSTRACT

This EG&G Idaho, Inc., report reviews the submittals for Regulatory Guide 1.97, Revision 3, for the R. E. Ginna Nuclear Power 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., 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).

Rochester Gas and Electric Corporation, the licensee for the R. E. Ginna Nuclear Power Plant, provided responses to the Regulatory Guide 1.97 portion of the generic letter on January 31, 1984 (Reference 4) and on February 28, 1985 (Reference 5).

This report provides an evaluation of those 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 installation 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 responses to NRC Generic Letter 82-33 on January 31, 1984 and February 28, 1985. This evaluation is based on those submittals.

3.1 Adherence to Regulatory Guide 1.97

The licensee stated that they plan to comply with Regulatory Guide 1.97, Revision 3, except where implementation can be made without meeting the exact recommendation of the regulatory guide. Their report presents justification, modifications or ongoing evaluations that are provided as resolutions for any identified deviations. The licensee lists completion dates for all proposed modifications to be complete on or before December 31, 1986. Therefore, we conclude that the licensee has provided an explicit commitment on conformance to Regulatory Guide 1.97, Revision 3 (Reference 6). 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. As plant specific emergency operating procedures are not fully developed, the licensee has not defined the Type A variables. By the licensee's explicit commitment on conformance, we assume that all Type A variables will comply with Category 1 recommendations. However, the licensee should identify these Type A variables and verify that the instrumentation is Category 1.

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 Neutron Flux

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. The licensee states that the source and intermediate range instruments are not Category 1.

The licensee has not provided justification for this deviation for the intermediate range instruments. For the source range instruments, they state that abnormal operating procedures would prevent the possibility of a boration dilution incident should the instrumentation fail. Sampling and analysis would be done to determine the boron concentration until the source range instruments are repaired. This would insure shutdown margin.

The measurement of neutron flux is a key variable for detecting an uncontrolled approach to criticality and for determination that an accident has been successfully mitigated. Since key variables are classified Category 1, the licensee should commit to the installation of Category 1 instrumentation for this variable in accordance with Regulatory Guide 1.97.

3.3.2 RCS Soluble Boron Concentration

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of 0 to 6000 ppm. The licensee's instrumentation has a range of 50 to 6000 ppm.

The licensee deviates from Regulatory Guide 1.97 with respect to the range of this post-accident sampling capability. This deviation 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.

3.3.3 Degrees of Subcooling

Regulatory Guide 1.97 recommends instrumentation for this variable with a range from 200°F subcooled to 35°F superheat. The licensee has instrumentation for this variable with a range of 0 to 100°F subcooled. The licensee states that this instrumentation is backup to the normal calculations used for this variable.

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

3.3.4 Containment Isolation Valve Position

Regulatory Guide 1.97 recommends environmentally qualified instrumentation for this variable. The licensee has not provided environmental qualification for this instrumentation. The licensee indicates that this variable is considered backup information and that failure of this instrumentation will not affect the safety function of the valves.

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.

3.3.5 Radioactivity Concentration or Radiation Level in Circulating Primary Coolant

The licensee indicates that radiation level measurements to indicate fuel cladding failure are provided by the post-accident sampling system, which is being reviewed by the NRC as part of their review of NUREG-0737, Item II.B.3.

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

3.3.6 Radiation Exposure Rate

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of 10^{-1} to 10^{4} R/hr. The licensee's instrumentation for this variable has a range of 10^{-4} to 10 R/hr. The licensee states that this range is acceptable because no access to these areas is required to service equipment. The licensee's justification does not address the purpose of this variable.

The licensee has not shown analysis of radiation levels expected for the monitor locations. The licensee should show that the radiation exposure rate monitors have ranges that encompass the expected radiation levels in their locations.

3.3.7 Residual Heat Removal (RHR) Heat Exchanger Outlet Temperature

Regulatory Guide 1.97 recommends a range for this variable of 40 to 350°F. The licensee has supplied a range of 0 to 310°F. The instrumentation supplied has a range where the upper limit of the span does not conform to the regulatory guide. The licensee has not provided a justification for this deviation. The licensee should justify this deviation or provide the recommended range.

3.3.8 Accumulator Tank Level and Pressure

Regulatory Guide 1.97 recommends a range for this variable of 10 to 90 percent of volume and 0 to 750 psig. The licensee has identified a deviation in that the level instrumentation for this variable covers a range of ±7 inches from the normal fill level. The licensee's justification for this deviation is that the present range is needed to meet the instrument accuracies required by technical specifications to ensure an adequate volume of borated water before any loss-of-coolant accident.

The accumulators are passive and discharge for reactor coolant system (RCS) breaks. The level and pressure measurement channels are not required to protect the integrity of the RCS boundary, to shutdown the reactor, to maintain it in a safe shutdown condition or to prevent or mitigate the consequences of an accident which could result in potential exposures. Therefore, we find that the instrumentation supplied for this variable (level and pressure) is adequate to determine that the accumulators have discharged, and is acceptable to monitor this variable.

3.3.9 Boric Acid Charging Flow

Regulatory Guide 1.97 recommends instrumentation for this variable with a range from 0 to 110 percent of design flow. The instrumentation supplied by the licensee has a range of 0 to 75 gpm. The licensee states that this is the maximum anticipated flow.

The licensee's justification indicates that the instrumentation will remain on scale for any accident condition. Therefore, we find this deviation acceptable.

3.3.10 Low Pressure Injection System Flow

Regulatory Guide 1.97 recommends instrumentation for this variable with a range from 0 to 110 percent of design flow. 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 Pressurizer Heater Status

Regulatory Guide 1.97 recommends electric current instrumentation for this variable. The licensee has an ammeter in the auxiliary building for the control group of heaters. The backup group of heaters has no metering. Both pressurizer heater groups have circuit breaker position indication in the control room.

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 for Westinghouse Pressurized Water Reactors, Section 4.4.3.2, require 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 in the control room.

3.3.12 Quench Tank Temperature

Regulatory Guide 1.97 recommends instrumentation for this variable with a range from 50 to 750°F. The instrumentation provided by the licensee has a range of 0 to 300°F. No justification was provided by the licensee for this deviation.

The licensee should show, as part of their justification, that the range of this instrumentation is greater than the maximum expected saturation temperature possible in this tank.

3.3.13 Steam Generator Level

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. Thus, independent and redundant instrumentation for each of the two steam generators should be provided at this station. The licensee indicates only two level transmitters (LT-460 and 470) and a shared common recorder (LR-460). This configuration does not satisfy the single failure criteria for Category 1 instrumentation. The licensee has not justified this lack of independance and full redundancy.

The licensee should provide independent wide range level instrumentation for each of the station's steam generators in accordance with the regulatory guide.

3.3.14 Containment Spray Flow

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. The licensee does not monitor this flow directly, but uses the sodium hydroxide additive flow and tank level, safety injection, residual heat removal and total flow to determine the core spray flow. The licensee has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this alternate instrumentation.

The licensee should provide this information, and show that the proposed alternate instrumentation is Category 2. The licensee should also verify that the containment spray flow can be determined when the flow is derived from the containment sump.

3.3.15 Containment Sump Water Temperature

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of 50 to 250°F. The licensee has not provided instrumentation for this variable. No justification has been given by the licensee for this exception.

The licensee should provide the recommended instrumentation for the functions outlined in Regulatory Guide 1.97 or identify other instruments that provide the same information and satisfy the regulatory guide.

3.3.16 Makeup Flow-In

Regulatory Guide 1.97 recommends instrumentation for this variable with a range from 0 to 110 percent of design flow. The instrumentation supplied by the licensee has a range of 0 to 75 gpm. The licensee states that this is the maximum anticipated flow.

The licensee's justification indicates that the instrumentation will remain on scale for any accident condition. Therefore, we find this deviation acceptable.

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

Regulatory Guide 1.97 recommends instrumentation for this variable with a range from 40 to 200°F. The instrumentation provided by the licensee has a range from 50 to 200°F.

The deviation of 10° out of the maximum span of 200° is 5 percent. We consider this deviation minor and acceptable.

3.3.18 Component Cooling Water Flow to ESF System

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of 0 to 110 percent design flow. The licensee has not provided instrumentation for this variable. The licensee has not justified this exception.

The licensee should provide the recommended instrumentation for the functions outlined in Regulatory Guide 1.97 or identify other instruments that provide the same information and satisfy the regulatory guide.

3.3.19 Radioactive Gas Holdup Tank Pressure

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of 0 to 150 percent of design pressure (0 to 225 psig). The instrumentation supplied by the licensee has a range of 0 to 150 psig. The licensee states that the pressure for normal operation of these tanks is between 100 and 110 psig.

Adequate justification for this deviation has not been provided by the licensee. The licensee should either change this instrumentation to conform with Regulatory Guide 1.97, or show that the existing pressure range cannot be exceeded under accident or post-accident conditions.

3.3.20 Accident Sampling (Primary Coolant, Containment Air and Sump)

The licensee's post-accident sampling system conforms with Regulatory Guide 1.97 except in the following areas:

1. Boron content--the range is 50 to 6000 parts per million rather than the recommended 0 to 6000 parts per million.

2. Chloride content--the range is 5 parts per billion to 100 parts per million rather than the recommended 0 to 20 parts per million.

3. Dissolved hydrogen--the range is 10-2000 cc/kg rather than the recommended 0 to 2000 cc/kg.

4. Dissolved oxygen--the range is 0.1 to 20 parts per million rather than the recommended 0 to 20 parts per million.

The licensee deviates from Regulatory Guide 1.97 with respect to post-accident sampling capability. These deviations go beyond the scope of this review and are being addressed by the NRC as part of their review of NUREG-0737, Item II.B.3.

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. The licensee should identify specific Type A variables, and verify that they are Category 1 (Section 3.4).

2. Neutron flux--the licensee should install Category 1 instrumentation for this variable (Section 3.3.1).

3. Containment isolation valve position--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.4).

4. Radiation exposure rate--the licensee should show that the instrumentation range encompasses the expected radiation levels in their locations (Section 3.3.6).

5. RHR heat exchanger outlet temperature--the licensee should either justify the deviation in the upper limit of the range or provide the recommended range (Section 3.3.7).

6. Low pressure coolant injection system flow--the licensee should provide the information required by Supplement No. 1 to NUREG-0737, identify any deviations from Regulatory Guide 1.97 and justify those deviations (Section 3.3.10).

7. Pressurizer heater status--the licensee should install electric current instrumentation in accordance with the regulatory guide (Section 3.3.11).

8. Quench tank temperature--the licensee should provide justification for the deviation in the upper limit of the range (Section 3.3.12).

9. Steam generator level--the licensee should provide redundant level channels for each steam generator (Section 3.3.13).

10. Containment spray flow--the licensee should provide additional justification in support of their use of alternate instrumentation for this variable (Section 3.3.14).

11. Containment sump water temperature--the licensee should provide this instrumentation in accordance with Regulatory Guide 1.97 or show that alternate instruments can satisfy the recommendations of the regulatory guide (Section 3.3.15).

12. Component cooling water flow to ESF system--the licensee should provide this instrumentation in accordance with Regulatory Guide 1.97 or show that alternate instruments can satisfy the recommendations of the regulatory guide (Section 3.3.18).

13. Radioactive gas holdup tank pressure--the licensee should either show that the existing range cannot be exceeded, or re-range this instrumentation in accordance with Regulatory Guide 1.97 (Section 3.3.19).

5. REFERENCES

1. NRC letter, D. G. Eisenhut to All Licensees of Operating Reactors, Applicants for Operating Licensees, and Holders of Construction Permits, "Supplement No. 1 to NUREG-0737--Requirements for Emergency Response Capability (Generic Letter No. 82-83)," 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. Rochester Gas and Electric Corporation letter, J. E. Maier to Director of Nuclear Reactor Regulation, NRC, "NUREG 0737, Supplement 1," January 31, 1984.

5. Rochester Gas and Electric Corporation letter, R. W. Kober to Director of Nuclear Reactor Regulation, NRC, "NSNRC Regulatory Guide 1.97," February 28, 1985.

6. Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident, Regulatory Guide 1.97, Revision 3, NRC, Office of Nuclear Regulatory Research, May 1983.

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