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TECHNICAL EVALUATION REPORT

CONFORMANCE TO REGULATORY GUIDE 1.97
H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

Docket No. 50-261

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ABSTRACT

This EG&G Idaho, Inc., report reviews the submittals for Regulatory Guide 1.97 for Unit No. 2 of the H. B. Robinson Steam Electric Plant and identifies areas of nonconformance to the regulatory guide. Exceptions to Regulatory Guide 1.97, Revision 3, are evaluated and those areas where sufficient basis for acceptability is not provided are identified.

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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 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).

Carolina Power and Light Company, the licensee for the H. B. Robinson Steam Electric Plant, Unit No. 2, addressed Section 6.2 of the generic letter on December 31, 1984 (Reference 4). This response addressed Revision 3 of Regulatory Guide 1.97 (Reference 5). This response was revised on July 18, 1985 (Reference 6). Additional information was provided on July 28, 1986 (References 7 & 8) and on October 20, 1986 (Reference 9). This report provides an evaluation of this material.

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 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. Where licensees or applicants explicitly state that instrument systems conform to the regulatory guide it was noted that no further staff review would be necessary. Therefore, this

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

3. EVALUATION

The licensee provided a response to Section 6.2 of NRC Generic Letter 82-33 on December 31, 1984. This response was revised on July 18, 1985. Additional information was provided on July 28, 1986 and October 20, 1986. This evaluation is based on these submittals.

3.1 Adherence to Regulatory Guide 1.97

The licensee has identified where the post-accident monitoring instrumentation conforms to Regulatory Guide 1.97, Revision 3, and where deviations exist. The licensee has committed to full compliance with Regulatory Guide 1.97 within three months after the completion of refueling outage 11 (Scheduled to begin approximately March 11, 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. Neutron flux (power range)

2. Reactor coolant system pressure (wide range)

3. Core exit temperature

4. Reactor coolant system hot leg water temperature

5. Reactor coolant system cold leg water temperature

6. Reactor water storage tank level

7. Condensate storage tank level

8. Containment water level

9. Containment pressure

10. Steam generator level (narrow range)

11. Steam generator pressure

12. Pressurizer level

13. Containment hydrogen concentration

14. Containment spray addition tank level

This instrumentation either meets or will be modified to meet the Category 1 requirements consistent with the requirements for Type A variables.

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 Reactor Vessel Water Level

The licensee takes exception to Regulatory Guide 1.97 with respect to the category of this instrumentation. The licensee states that the core exit temperature instrumentation (Category 1) is the key variable for direct indication of core cooling and that the reactor vessel water level instrumentation is used for backup verification and, therefore, is considered Category 3. The licensee indicates that a reactor vessel level

instrumentation system will be designed and installed to comply with Regulatory Guide 1.97 requirements for Category 3 variables.

This exception goes beyond the scope of this review and is being addressed by the NRC as part of their review of NUREG-0737, Item II.F.2.

3.3.2 Degrees of Subcooling

The licensee takes exception to Regulatory Guide 1.97 with respect to the category of this instrumentation. The licensee states that the core exit temperature instrumentation (Category 1) is the key variable for direct indication of core cooling and the reactor cooling system (RCS) subcooling margin instrumentation is used for backup verification and, therefore, is considered Category 3. Also, the RCS subcooling margin is a derived variable calculated from the RCS hot leg temperature, the RCS cold leg temperature, the RCS pressure, and the core exit temperature instrumentation, which are Category 1.

This exception goes beyond the scope of this review and is being addressed by the NRC as part of their review of NUREG-0737, Item II.F.2.

3.3.3 Containment Isolation Valve Position

The licensee takes exception to Regulatory Guide 1.97 with respect to individual valve position indication, channel independence (power source), redundancy, and control room recording capability.

The licensee states that redundant indications and independent power supplies for each valve are not considered necessary based on the redundant containment isolation barriers being utilized. The individual valve position indication is recorded by the emergency response facility information system (ERFIS) and is provided on-demand for each of the containment isolation valves. The existing individual and ganged valve position indicating lights will remain in use to supplement the ERFIS. We find the licensee's control room recording capability acceptable.

Reference 9 provided clarification on the power sources for the indication of the position of the isolation valves. The licensee states that where two motor-operated valves are used in series to provide containment isolation for a given penetration, the valve motors and indication are powered from separate sources for each valve. Air-operated valves fail closed on loss of power, therefore, isolation is assumed on loss of indication.

From the information provided, we find that the licensee deviates from a strict interpretation of the Category 1 redundancy recommendation. Only the active valves have position indication (i.e., check valves have no position indication). Since redundant isolation valves are provided, we find that redundant indication per valve is not intended by the regulatory guide. Position indication of check valves is specifically excluded by Table 2 of Regulatory Guide 1.97. Therefore, we find this deviation acceptable.

3.3.4 Radiation Level in Circulating Primary Coolant

The licensee states that the core exit temperature instrumentation (Category 1) is the key variable for indication of a significant breach or potential breach of fuel cladding due to elevated fuel temperatures. The reactor coolant system radioactivity instrumentation and the post-accident sampling system (PASS) provide backup verification of a breach of cladding and indicate the extent of the breach. Therefore, the licensee considers the instrumentation Category 3 instead of Category 1.

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

3.3.5 Containment Hydrogen Concentration

The licensee takes exception to Regulatory Guide 1.97 with respect to seismic and environmental qualifications for this variable. The licensee

states that information is available that discusses the instruments' generic qualifications; however, no specific comparison has been made for the H.B. Robinson Plant.

The NRC reviewed the acceptability of this variable as part of their review of NUREG-0737, Item II.F.1.6, and found it acceptable.

3.3.6 Flow in Low Pressure Coolant Injection System

Regulatory Guide 1.97 recommends Category 2 instrumentation with a range of 0 to 110 percent of design flow for this variable. The licensee's original submittal did not provide information on instrumentation for this variable.

Reference 7 states that the low pressure coolant injection function is provided by the residual heat removal system, that has Category 2 instrumentation with a range of 0 to 8,500 gpm. This satisfies the recommendations of the regulatory guide and is, therefore, acceptable.

3.3.7 Reactor Coolant Pump Status

The licensee uses reactor coolant system (RCS) loop flow instrumentation for this variable. The justification is that the RCS loop flow is a more definitive indication of pump operation, showing how much flow is provided for each loop. Thus, the licensee uses it in place of the reactor coolant pump status.

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

3.3.8 Primary Power Operated Relief Valve (PORV) Position

The licensee deviates from Regulatory Guide 1.97 with respect to environmental qualification for this existing instrumentation. Reference 7

provides a commitment to either repair the existing PORVs, using qualified position switches or to replace the existing PORVs. Any replacement PORVs would have environmentally qualified position switches. We find this commitment acceptable.

3.3.9 Primary Safety Relief Valve Position

The licensee deviates from Regulatory Guide 1.97 with respect to the environmental qualification for this existing instrumentation. Reference 7 provides a commitment to provide environmental qualification. Vendor documentation will be reviewed to show environmental qualification, and the preamplifier will either be mounted in qualified junction boxes or relocated outside containment. We find this commitment acceptable.

3.3.10 Pressurizer Heater Status

Regulatory Guide 1.97 recommends monitoring the pressurizer heater electric current. The licensee monitors the pressurizer heater status by the following:

- heater circuit breaker position
- diesel generator load (kw)
- emergency bus current
- emergency bus voltage

Additionally, an accident signal automatically trips open the pressurizer heater circuit breaker. The licensee states that the 125 kw load increase is observable on the above Category 2 instrumentation.

Based on this alternate instrumentation being able to detect the energization of the pressurizer heaters, we find this deviation acceptable.

3.3.11 Quench Tank Temperature

The licensee did not provide information on the instrumentation for this variable in the initial submittals. Reference 7 identifies instrumentation with a range of 50 to 350°F for this variable. The temperature of the tank contents is limited to less than 350°F by operation of a rupture disc that limits the tank pressure to approximately 100 psig. Since the contents are saturated steam, the 100 psig limit limits the temperature to less than 350°F. Thus, we find this deviation from the regulatory guide acceptable.

3.3.12 Containment Spray Flow

The licensee's initial responses did not identify environmental qualification for this instrumentation. Reference 7 shows that the vendor had performed qualification testing. The licensee states that this instrumentation is environmentally qualified to the environmental parameters required by 10 CFR 50.49. Thus, we find this instrumentation acceptable.

3.3.13 Heat Removal by the Containment Fan Heat Removal System

The licensee's initial response indicated that the sensors for this instrumentation were not environmentally qualified. Reference 7 states that replacement environmentally qualified sensors are on hand to be installed prior to the begining of refueling outage number 11. We find this commitment acceptable.

3.3.14 Containment Atmosphere Temperature

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of 40 to 400°F. The licensee deviates from Regulatory Guide 1.97 with respect to the range of this instrumentation. The justification provided by the licensee is that the existing range of 0 to 300°F is

adequate for all accident and post-accident conditions and it exceeds the maximum containment design temperature of 264.7°F.

Since the worst case postulated accident will not increase the containment atmosphere temperature above 265°F, we find the range 0 to 300°F adequate to monitor this variable during all accident and post-accident conditions.

3.3.15 Containment Sump Water Temperature

The licensee states, in Reference 5, that the containment sump water temperature is not required for residual heat removal (RHR) operation or for assurance that the net positive suction heat (NPSH) requirements are met as NPSH calculations assume the presence of saturated water. The temperature of this saturated water can be infered, either directly or indirectly, by the following instrumentation provided by the licensee:

- o containment temperature (Category 2)
- o containment pressure (Category 1)
- o residual heat removal heat exchanger inlet temperature (Category 3)

The licensee considers the containment temperature and pressure as key variables for monitoring the containment cooling system; the RHR heat exchanger inlet temperature as a backup variable.

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

3.3.16 Charging Flow

The licensee's initial responses did not identify environmental qualification for this instrumentation. Reference 7 shows that the vendor had performed qualification testing. The licensee states that this instrumentation is environmentally qualified to the environmental parameters required by 10 CFR 50.49. Thus we find this instrumentation acceptable.

3.3.17 Component Cooling Water (CCW) Flow to Engineered Safety Feature (ESF) System Components

The licensee does not provide instrumentation for this variable. The justification provided by the licensee is that other parameters monitor the operation of the CCW system. The CCW header flow indication is downstream of all three CCW pumps, providing an indication of total flow to all ESF components. The CCW surge tank level instrumentation provides indication that an adequate surge volume and a suction head for the CCW pumps is available. The valves in the lines going to the residual heat removal (RHR), safety injection (SI), and core spray (CS) pumps are manually operated and are required by administrative controls to be open prior to plant startup. As backup to the header flow, low flow indication on the CCW lines at the discharge from the RHR, SI, and CS pumps are used. One low cooling water flow indication exists for the return from the three SI pumps and one low cooling water flow indication exists for each CS pump. Each RHR pump has a low cooling water flow indication. The CCW pump status is used for backup information.

The alternate instrumentation, a combination of Category 2 and 3 instrumentation, provided by the licensee is adequate to monitor this variable. Therefore, we find this deviation acceptable.

3.3.18 CCW Temperature to ESF System Components

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. The licensee deviates from Regulatory Guide 1.97 with respect to the category of this instrumentation. The licensee provides Category 3 instrumentation for this variable. Reference 7 states that this instrumentation is being reviewed to establish its environmental qualification. Further, the licensee states that if the instrumentation is found not to be qualified for its application, that they would either be replaced with environmentally qualified instrumentation or other Category 2 instruments would be identified that provide the same information.

We find this commitment acceptable, however, should the licensee chose to use alternate instrumentation, it should be identified and justified.

3.3.19 Emergency Ventilation Damper Position

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. The licensee uses low air flow indicators for the four heating, ventilation, and air conditioning units and an indication of motor status for each of these units. The licensee states that these adequately infer damper position. In addition, the dampers (normal and emergency) are designed to Category 2 criteria, are designed fail-safe and the solenoids which operate the dampers are environmentally qualified.

Based on the alternate indication provided, we find the lack of position indication in the control room for this variable acceptable.

3.3.20 Containment Area Radiation-High Range

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. The licensee states, in Reference 7, that this instrumentation was purchased and installed as fully environmentally and seismically qualified and that it currently meets the Category 1 requirements. Also the licenses states that this instrumentation was purchased and installed conforming with NUREG-0737 requirements.

We find this to be a good faith attempt, as defined in NUREG-0737, Supplement No. 1, Section 3.7 (Reference 3), to meet NRC requirements and is, therfore, acceptable.

3.3.21 Radiation Exposure Rate

The licensee has provided alternate instrumentation for this variable consisting of area radiation monitors and portable radiation monitoring equipment.

From a radiological standpoint if the area radiation monitors showed any abnormal levels, personnel would not be permitted into the area without portable monitoring (except for life saving). Based on this, we find the instrumentation supplied for this variable acceptable.

3.3.22 Vent From Steam Generator Safety Relief Valves or Atmospheric Dump Valves (SG Blowdown Radiation Level)

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of 10^{-1} to 10^{3} μCi/cc, the duration of the release in seconds and mass of steam per unit time. The licensee states, in Reference 7, that the main steamline radiation level monitors are used for this variable. They satisfy the range and category requirements of Regulatory Guide 1.97. We find this instrumentation acceptable for this variable.

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

Regulatory Guide 1.97 recommends a range of 0 to 6000 parts per million for the boron content instrumentation and a range of 1 to 13 for the pH instrumentation. The licensee provides a range of 0 to 5000 parts per million for the boron content instrumentation and a range of 2 to 12 for the PH instrumentation. The licensee states that boron concentration and pH are not considered essential to the purpose of type E variables, which are to access radiation release. The current pH meter range is

considered acceptable by the licensee since any sample beyond this range would be beyond the range of recoverable actions and extending the range would decrease its sensitivity in the normal range.

The licensee deviates from Regulatory Guide 1.97 with respect to 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.

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 exception:

1. Component cooling water temperature to ESF system--should the licensee choose to use alternate instrumentation, it should be identified and justified (Section 3.3.18)

5. REFERENCES

1. D. G. Eisenhut, NRC letter to all Licensees of Operating Reactors, Applicants for Operating License, 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. Carolina Power & Light Company letter, E. E. Utley to S. A. Varga, NRC, "Response to Order Confirming Commitments on Emergency Response Capability," December 31, 1984, Serial NLS-84-509

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. Carolina Power & Light Company letter, S. R. Zimmerman to Director of Nuclear Reactor Regulation, NRC, "Revision 1 to Compliance Report for Regulatory Guide 1.97, Revision 3," July 18, 1985, Serial NLS-85-198

7. Carolina Power & Light Company letter, A. B. Cutter to Director of Nuclear Reactor Regulation, NRC, "Response to Interim Report Regarding Regulatory Guide 1.97," July 28, 1986, Serial: NLS-86-257.

8. Carolina Power & Light Company letter, A. B. Cutter to Director of Nuclear Reactor Regulation, NRC, "Revision No. 2 to Regulatory Guide 1.97 Submittal", July 28, 1986, Serial: NLS-86-267.

9. Carolina Power & Light Company letter, S. R. Zimmerman to Director of Nuclear Reactor Regulation, NRC, "Supplemental Response to Regulatory Guide 1.97 Interim Report," October 20, 1986, Serial: NLS-86-396.

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