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

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Published April 1986

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Prepared for the
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under DOE Contract No. DE-AC07-76ID01570
FIN No. A6483

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.

Docket No. 50-261

TAC No. 51127

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.

The U.S. Nuclear Regulatory Commission funded the work under authorization B&R 20-19-10-11-3.

Docket No. 50-261
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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. 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 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.

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.

However, a single power source for the indication of the position of both valves is unacceptable and does not satisfy the single failure criteria. We assume that of the two valves identified in Table B of the response that are powered by the same power source, one valve is located inside containment and the other valve is located outside containment. If this is the case, there is no redundancy and failure of the single power source fails the indication for both valves. The licensee should provide specific information on the valve functions and clarification of the power supply configuration. The lack of independent power sources is unacceptable.

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 does not provide instrumentation for this variable, and did not provide a justification for this exception.

The licensee should install the Category 2 flow instrumentation in accordance with the recommendations of Regulatory Guide 1.97.

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 instrumentation. The licensee has not provided a justification for this deviation.

Environmental qualification has been clarified by the Environmental Qualification Rule, 10 CFR 50.49. The licensee should therefore provide the required justification for this deviation from Regulatory Guide 1.97 or provide instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and Regulatory Guide 1.97.

3.3.9 Primary Safety Relief Valve Position

The licensee deviates from Regulatory Guide 1.97 with respect to the environmental qualification for this instrumentation. The licensee has not provided a justification for this deviation.

Environmental qualification has been clarified by the Environmental Qualification Rule, 10 CFR 50.49. The licensee should therefore provide the required justification for this deviation from Regulatory Guide 1.97 or provide instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and Regulatory Guide 1.97.

3.3.10 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 for Westinghouse reactors, Section 4.4.3.2, require that the emergency pressurizer heater current be measured quarterly. These emergency power supplied heaters should have the current instrumentation recommended by Regulatory Guide 1.97.

3.3.11 Quench Tank Temperature

The licensee does not provide instrumentation for this variable. The justification provided by the licensee is that the quench tank level and pressure are the only indications needed to act as backup to the pressurizer power operated relief valves (PORV) and pressurizer safety relief valve position. Additionally, the quench tank design pressure is 100 psig. A rupture disc limits pressure to approximately 100 psig; therefore, the quench tank temperature would not go above approximately 300°F. Since the quench tank is under saturated conditions, the licensee states that the quench tank pressure will provide the means for determining temperatures.

We find the licensee's justification for not providing the instrumentation for the quench tank temperature unacceptable. The temperature of the contents of the quench tank is needed to verify the capability of quenching additional releases from the pressurizer. A direct measure of this variable is needed. Therefore, the licensee should provide the instrumentation recommended by Regulatory Guide 1.97.

3.3.12 Containment Spray Flow

The licensee deviates from Regulatory Guide 1.97 with respect to environmental qualification for this instrumentation. The licensee has not provided a justification for this deviation.

Environmental qualification has been clarified by the Environmental Qualification Rule, 10 CFR 50.49. The licensee should therefore provide the required justification for this deviation from Regulatory Guide 1.97 or provide instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and Regulatory Guide 1.97.

3.3.13 Heat Removal by the Containment Fan Heat Removal System

The licensee deviates from Regulatory Guide 1.97 with respect to environmental qualification for this instrumentation. The licensee has not provided a justification for this deviation.

Environmental qualification has been clarified by the Environmental Qualification Rule, 10 CFR 50.49. The licensee should therefore provide the required justification for this deviation from Regulatory Guide 1.97 or provide instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and Regulatory Guide 1.97.

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 does not provide instrumentation for this variable. The justification provided by the licensee is that containment sump water temperature is not required for residual heat removal (RHR) operation or assurance that net positive suction heat (NPSH) requirements are met as NPSH calculations assume the presence of saturated water. Numerous parameters in the reactor coolant system, as well as containment

temperature and pressure, determine the plant conditions. Containment sump level indicates the quantity of water present and the previously mentioned parameters indicate its source. Therefore, the licensee does not provide containment sump water temperature indication.

This is insufficient justification 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 (such as the residual heat removal heat exchanger inlet temperature) and satisfy the regulatory guide.

3.3.16 Charging Flow

The licensee deviates from Regulatory Guide 1.97 with respect to environmental qualification for this instrumentation. The licensee has not provided a justification for this deviation.

Environmental qualification has been clarified by the Environmental Qualification Rule, 10 CFR 50.49. The licensee should therefore provide the required justification for this deviation from Regulatory Guide 1.97 or provide instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and Regulatory Guide 1.97.

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, but did not provide a justification for this deviation.

The licensee should provide the recommended Category 2 instrumentation for the functions outlined in Regulatory Guide 1.97 or identify other instruments that provide the same information and satisfy the recommendations of the regulatory guide.

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 that if the environmental qualification data is not acceptable, the detector will be replaced, bringing the instrumentation into compliance with Category 2 recommendations.

The licensee has not justified the deviation from Category 1 to Category 2. The licensee should upgrade this instrumentation to Category 1.

3.3.21 Radiation Exposure Rate

The licensee has not provided instrumentation for this variable. 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 recommendations of the regulatory guide.

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 that the current instrumentation has a range of 4×10^{-5} to 3.5×10^{-2} μCi/cc. The licensee states that the current instrumentation will be replaced with Category 2 instrumentation; however, the replacement range is not stated to be in compliance with the regulatory guide.

The licensee should either provide the recommended range, or provide justification for the deviation.

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 exceptions:

1. Containment isolation valve position--the licensee should provide clarification on channel independence (Section 3.3.3).

2. Flow in low pressure injection system--the licensee should provide the recommended Category 2 instrumentation (Section 3.3.6)

3. Primary power operated relief valve position--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.8)

4. Primary safety relief valve position--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.9)

5. Pressurizer heater status--the licensee should provide the recommended instrumentation (Section 3.3.10)

6. Quench tank temperature-the licensee should provide the recommended instrumentation (Section 3.3.11)

7. Containment spray flow--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.12)

8. Heat removal by the containment fan heat removal system--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.13)

9. Containment sump water temperature-the licensee should provide the recommended instrumentation (Section 3.3.15)

10. Charging flow--environmental qualification should be addressed in accordance with 10 CFR 50.49 (Section 3.3.16)

11. Component cooling water temperature to ESF system--the licensee should provide the recommended instrumentation (Section 3.3.18)

12. Containment area radiation-high range--the licensee should upgrade this instrumentation to Category 1 (Section 3.3.20).

13. Radiation exposure rate--the licensee should provide the recommended instrumentation (Section 3.3.21)

14. Vent from steam generator safety relief valves or atmospheric dump valves--the licensee should provide the recommended range or justify any alternate range (Section 3.3.22)

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. 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

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.

NRC FORM 335
(2-84)
NRCM 1102,
3201, 3202

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

SEE INSTRUCTIONS ON THE REVERSE

1. REPORT NUMBER (Assigned by TIDC, add Vol. No., if any)
EGG-NTA-7113

2. TITLE AND SUBTITLE
Conformance to Regulatory Guide 1.97,
H. B. Robinson Steam Electric Plant,
Unit No. 2

3. LEAVE BLANK

4. DATE REPORT COMPLETED

MONTH	YEAR
April	1986

5. AUTHOR(S)
A. C. Udy
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6. DATE REPORT ISSUED

MONTH	YEAR
April	1986

7. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)
EG&G Idaho, Inc.
Idaho Falls, ID 83415

8. PROJECT/TASK/WORK UNIT NUMBER

9. FIN OR GRANT NUMBER
A6483

10. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)
Division of PWR Licensing - A
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, DC 20555

11a. TYPE OF REPORT
Preliminary Technical
Evaluation Report

b. PERIOD COVERED (Inclusive dates)

12. SUPPLEMENTARY NOTES

13. ABSTRACT (200 words or less)

This EG&G Idaho, Inc. report reviews the submittal for H. B. Robinson Steam Electric Plant, Unit No. 2 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.

14. DOCUMENT ANALYSIS - a. KEYWORDS/DESCRIPTORS

b. IDENTIFIERS/OPEN-ENDED TERMS

15. AVAILABILITY STATEMENT
Limited
Distribution

16. SECURITY CLASSIFICATION
(This page)
Unclassified
(This report)
Unclassified

17. NUMBER OF PAGES

18. PRICE