ENCLOSURE

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TECHNICAL EVALUATION REPORT

CONFORMANCE TO REGULATORY GUIDE 1.97: WATTS BAR-1/-2

Docket Nos. 50-390/50-391

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SUMMARY

This EG&G Idaho, Inc., report documents the review of the Regulatory Guide 1.97, Revision 2, submittals for the Watts Bar Nuclear Plant and identifies areas of nonconformance to the regulatory guide. Exceptions to Regulatory Guide 1.97 are evaluated and areas where sufficient basis for acceptability is not provided are identified.

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PREFACE

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 Technology, by EG&G Idaho, Inc., Regulatory and Technical Assistance Unit.

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CONFORMANCE TO REGULATORY GUIDE 1.97: WATTS BAR-1/-2

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).

Tennessee Valley Authority, the applicant for the Watts Bar Nuclear Plant, provided a response to Item 6.2 of the generic letter on January 30, 1983 (Reference 4). This response reviewed the post-accident monitoring instrumentation provided to the recommendations of Regulatory Guide 1.97.

The applicant provided additional information on April 16, 1985 (Reference 5). The applicant provided an additional submittal on August 31, 1990 (Reference 6). The Reference 6 submittal completely replaced the earlier submittals. This information was supplemented on October 11, 1990 (Reference 7), and January 3, 1991 (Reference 8), with schedular information.

This report is based on the recommendations of Regulatory Guide 1.97, Revision 2. This report compares the instrumentation proposed by the applicant's August 31, 1990, submittal, as supplemented by schedular submittals of October 11, 1990, and January 3, 1991, with these recommendations.

2. REVIEW REQUIREMENTS

Item 6.2 of NUREG-0737, Supplement No. 1, sets forth the documentation to be submitted in a report to the NRC describing how the applicant complies with Regulatory Guide 1.97 as applied to emergency response facilities. The documentation should provide 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 submittals should identify any deviations taken from the regulatory guide recommendations and provide supporting justification or alternatives for the deviations identified.

Subsequent to issuing 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 address only the exceptions taken to Regulatory Guide 1.97. It was also noted that when licensees or applicants explicitly state that instrument systems conform to the regulatory guide, no further staff review would be necessary. Therefore, this report

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

3. EVALUATION

The applicant provided responses to Item 6.2 of NRC Generic Letter 82-33 on January 30, 1984, April 16, 1985, August 31, 1990, October 11, 1990, and January 3, 1991. The August 31, 1990 (Reference 6), response consolidates and replaces the previous responses, describing the applicant's position on post-accident monitoring instrumentation. The October 11, 1990, and January 3, 1991, submittals provide schedular information. This evaluation compares the material provided in Reference 6 to the recommendations of Revision 2 of Regulatory Guide 1.97.

3.1 Adherence to Regulatory Guide 1.97

The applicant documented their review of the Watts Bar Nuclear Plant post-accident monitoring instrumentation. The applicant based their review on Revision 2 of Regulatory Guide 1.97, the Watts Bar emergency instructions, and a safety analysis that incorporates the Final Safety Analysis Report (FSAR) Chapter 15 design basis accidents. The applicant provided justification where deviations exist from the recommendations of the regulatory guide. The applicant discussed the design criteria used for the instrumentation involved. The applicant scheduled upgrades to instrumentation. Therefore, we conclude that the applicant 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 applicant classifies the following instrumentation as Type A.

1. auxiliary feedwater flow

2. containment lower compartment atmospheric temperature

3. containment pressure (-2 psig to 15 psig)

4. containment radiation

5. containment sump water level (zero to 20 feet)

6. core exit temperature

7. main steamline radiation

8. neutron flux -- source range (1 to 10^6 counts per second)

9. reactor coolant system (RCS) pressurizer level

10. RCS pressure (zero to 3000 psig)

11. RCS cold leg water temperature

12. RCS hot leg water temperature

13. refueling water storage tank level

14. steam generator level -- narrow range

15. steam generator pressure

16. subcooling margin monitor

These variables, with exceptions as noted in Section 3.3, either meet or will be upgraded to meet the Category 1 recommendations, consistent with the requirements for Type A variables.

3.3 Exceptions to Regulatory Guide 1.97

The applicant identified deviations and exceptions to Regulatory Guide 1.97. The following paragraphs discuss these deviations and exceptions.

3.3.1 RCS Soluble Boron Concentration

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of zero to 6000 parts per million. The applicant has not provided on-line instrumentation for this variable. Instead, the applicant samples with the post-accident sampling facility. The tolerance for a reading of boron concentration less than 500 parts per million is ±50 parts per million. With this uncertainty, the lower limit of the recommended range may not be realistically attainable.

The applicant deviates from Regulatory Guide 1.97 with respect to post-accident sampling capability. This deviation goes beyond the scope of this review and was approved by the NRC as part of their review of NUREG-0737, Item II.B.3.

3.3.2 RCS Cold Leg Water Temperature

Revision 2 of Regulatory Guide 1.97 recommends a range of 50°F to 750°F for this variable. The applicant has instrumentation with a range of 50°F to 700°F. The applicant states that 650°F is the design temperature of the RCS and that the maximum temperature during any expected transient is less than

700°F. The provided range allows a 50°F margin over the design temperature to accommodate transients.

The applicant indicates that the 50°F to 700°F range exceeds all expected design basis conditions. Further, Revision 3 of Regulatory Guide 1.97 (Reference 9) recommends a range of 50°F to 700°F. The applicant's instrumentation meets this range. Based on this, we find this deviation acceptable.

3.3.3 RCS Hot Leg Water Temperature

Revision 2 of Regulatory Guide 1.97 recommends a range of 50°F to 750°F for this variable. The applicant has instrumentation with a range of 50°F to 700°F. The applicant states that 650°F is the design temperature of the RCS and that the maximum temperature during any expected transient is less than 700°F. The provided range allows a 50°F margin over the design temperature to accommodate transients.

The applicant indicates that the 50°F to 700°F range exceeds all expected design basis conditions. Further, Revision 3 of Regulatory Guide 1.97 (Reference 9) recommends a range of 50°F to 700°F. The applicant's instrumentation meets this range. Based on this, we find this deviation acceptable.

3.3.4 Containment Sump Water Level -- Narrow-Range

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable with a site specific range. The applicant has Category 3 instrumentation that monitors the reactor building sump with a range of 2 inches to 66 inches.

The applicant indicates that the leakage rate before an accident is the parameter of concern monitored by this instrumentation. The instrumentation is not the basis for operator or automatic operation of safety-related equipment. The leakage monitored is not enough to cause plant perturbations or transients that would cause a reactor trip signal or a safety-injection signal.

We conclude that the applicant has provided appropriate monitoring for the parameter of concern. We base this conclusion on the following:

a. For small leaks, the instrumentation will not experience harsh environments during operation and will show response to the leak.

b. For larger leaks, the sumps fill promptly and the sump drain lines isolate due to the increase in containment pressure, thus negating the narrow-range instrumentation (the wide-range instrumentation will still provide valid signals).

c. This instrumentation neither automatically starts nor alerts the operator to start operation of a safety-related system in a post-accident situation.

Therefore, we find the Category 3 narrow-range instrumentation provided acceptable.

3.3.5 Containment Pressure

Regulatory Guide 1.97 recommends instrumentation for this variable with readouts of zero to design pressure, 10 psia to design pressure, and 10 psia to 4 times design pressure. The applicant has instrumentation with readouts of -2 psig to 15 psig and -5 psig to 60 psig. The applicant identified a deviation in the range of the narrow-range instruments (-2 psig to 15 psig).

The applicant's wide-range instruments cover the negative pressures recommended by the regulatory guide with no apparent loss of resolution. Therefore, the applicant's instrumentation is acceptable.

3.3.6 Containment Isolation Valve Position

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. The applicant identified a deviation from this recommendation. Flow control valves (FCV) that are part of the RCS letdown system will become submerged following an accident. The valves affected, FCV-62-72, -73, -74, and -76, have limit switches not qualified for submerged operation.

The applicant states that the valve position is indicated well in advance of submergence. Position indication is lost by the assumed operation of the control circuit fuses when water enters the limit switches. The applicant states the valves will not change position after being submerged because the valves were designed and tested to vent closed on the loss of control power. Based on the described operation of the valves, we find this deviation acceptable.

3.3.7 Radiation Level in Circulating Primary Coolant

The applicant states that the post-accident sampling facility provides radiation level measurements to indicate fuel cladding failure. This capability was reviewed and approved by the NRC as part of their review of NUREG-0737, Item II.B.3.

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

3.3.8 Containment Hydrogen Concentration

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of zero to 30 percent for an ice condenser containment. The applicant has instrumentation with a range of zero to 10 percent. The applicant has performed an analysis showing the containment hydrogen concentration will be less than 4 percent in the worst case with one of the hydrogen recombiners operating. The hydrogen igniter system also maintains the hydrogen concentration at less than 10 percent. The hydrogen recombiner system indicates operation in the control room. Additionally, the post-accident sampling facility can provide a diverse source of information concerning containment hydrogen concentration. The NRC approved a range to 10 percent for this system. See Section 3.3.33.

As this instrumentation remains on-scale for all post-accident situations, we find the zero to 10 percent range provided for this instrumentation acceptable.

3.3.9 Radiation Exposure Rate

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable with a range of 10^{-1} R/hr to 10^{4} R/hr. The purpose of this instrumentation is to provide an indication of containment breach, the detection of significant releases, release assessment, and long-term surveillance. Revision 3 of the regulatory guide deletes the instrumentation for measuring releases caused by a containment breach.

The applicant identified instrumentation to monitor the radiation level in the main control room. However, the range identified is 10^{-1} mR/hr to 10^{4} mR/hr. The limits of the provided range are three decades less than recommended. The applicant did not justify this deviation for this continually manned area. Other instrumentation for this variable is not evident in Reference 6.

The applicant should identify all instrumentation for this variable. Where the instrumentation does not comply with the recommendations of the regulatory guide, the applicant should provide adequate technical justification for those deviations.

3.3.10 RHR Heat Exchanger Outlet Temperature

Regulatory Guide 1.97 recommends a range of 32°F to 350°F for this variable. The applicant's instrumentation has a range of 50°F to 400°F.

Revision 3 of the regulatory guide (Reference 9) increases the minimum recommended range to 40°F. Thus the lower limit of the range deviates from the recommended limit by 10°F. Considering instrument accuracy, we find this deviation minor and acceptable.

3.3.11 Accumulator Tank Level and Pressure

Regulatory Guide 1.97 recommends Category 2 instrumentation with ranges of zero to 750 psig and 10 percent to 90 percent volume. Watts Bar has pressure instrumentation for these accumulators with a range of zero to 700 psig, which exceeds the technical specification requirements. The technical specifications require a nitrogen blanket pressure of 632 psig. A pressure relief valve maintains pressure below 700 psig. We find the present zero to 700 psig range acceptable; it will enable the operator to monitor the discharge of these accumulators.

The range identified for the level instrumentation, 75 percent to 82 percent, is acceptable only if the accumulator tank pressure is the key variable in determining the discharge of the accumulator tanks. We note that the range of the level instrumentation coincides with the technical specification requirements. These requirements are to maintain between 7,632 gallons and 8,264 gallons in each accumulator.

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. Category 2 requirements include environmental qualification. Environmentally qualified instrumentation should be available to the operator to monitor the status of the accumulators through the course of an accident. The applicant proposed to use the RCS pressure instrumentation as alternate instrumentation for the accumulator level and pressure instrumentation. However, RCS pressure does not conclusively show that an accumulator, part of a safety-related system, has discharged. Therefore, the applicant should designate either level or pressure as the key variable for observing accumulator discharge. The applicant should provide instrumentation for this key variable that meets the requirements of 10 CFR 50.49 and Regulatory Guide 1.97.

3.3.12 Accumulator Isolation Valve Position

Regulatory Guide 1.97 recommends Category 2 indication of the position of these valves. The applicant states that these valves do not change position following an accident. By design, the operator manually removes power to these valves as part of the startup procedure. Because these valves are open and cannot inadvertently change position during or following an accident, we consider the Category 3 indication for the position of these valves acceptable.

3.3.13 Boric Acid Charging Flow

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. The applicant's boric acid charging flow instrumentation is Category 3.

The applicant states that this flow path is a normally isolated line and requires manual operator action for use. It is not one of the safety injection paths at Watts Bar. Based on this design, we find the instrumentation provided for this variable acceptable.

3.3.14 Pressurizer Heater Status

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. The applicant did not identify instrumentation for the nonsafety-related heater banks. The applicant has provided the appropriate instruments for two safety-related banks of heaters. We find the instrumentation provided for the safety-related heater banks acceptable for this variable.

3.3.15 Quench Tank (Pressurizer Relief Tank) Temperature

Regulatory Guide 1.97 recommends a range of 50°F to 750°F for this variable. The applicant's instrumentation has a range of 50°F to 300°F.

The applicant provided the following information to support the deviation from the upper limit of the recommended range. First, the pressurizer relief tank rupture disc operates at 93 ±7 psig. Assuming worst case limits, this pressure relief limits the temperature of the tank contents to saturated conditions, approximately 350°F. Second, any temperature trending upward would alert the operator to an abnormal condition. The operator would respond by checking other post-accident monitoring instruments.

The regulatory guide states that the instrumentation should always be on-scale. The Watts Bar design could permit a high off-scale reading. Therefore, the provided range is not acceptable. The applicant should expand the range to include saturated steam conditions of approximately 350°F (corresponding to 100 psig).

3.3.16 Steam Generator Level -- Wide-Range

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. The applicant, in Reference 6, committed to provide one Category 1 instrument channel per steam generator. Regulatory Guide 1.97 specifically

allows one channel of this instrumentation per steam generator. Thus, the applicant's instrumentation for this variable will be in conformance to Regulatory Guide 1.97.

3.3.17 Steam Generator Pressure

Regulatory Guide 1.97 recommends instrumentation for this variable with a range from zero to 20 percent above the lowest safety valve setting. The applicant's instrumentation has a range of zero to 1300 psig. The range corresponding to the regulatory guide recommendation would be zero to 1422 psig.

The applicant provides the following justification for using the zero to 1300 psig range. First, the design pressure of the main steam system is 1185 psig. Second, all main steam safety valves are open at 1224 psig or below. Additionally, with all the main steam safety valves open, the pressure is, by design, not expected to exceed 1284 psig.

Based on the applicant's justification, we find that the main steam system pressure will not exceed the zero to 1300 psig range of the pressure instrumentation. Therefore, we find the range provided acceptable.

3.3.18 Auxiliary Feedwater Flow

The applicant identified this as a Type A variable, but did not identify the range of the instrumentation. Regulatory Guide 1.97 recommends a range of zero to 110 percent of design flow. The applicant states that the loop design flow is 470 gallons per minute; therefore, the range required is zero to 517 gallons per minute. The applicant also states that the maximum auxiliary feedwater flow is 1880 gallons per minute (4 times 470). The statement leads us to wonder if there is separate instrumentation that indicates total auxiliary feedwater flow. The applicant should clarify the instrumentation

provided for this variable, and show that each channel has a range that covers to at least 110 percent of the design flow at the transmitter location.

3.3.19 Condensate Storage Tank Water Level

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable except where the condensate storage tank is not the primary source of auxiliary feedwater. Should another water source be the primary source of auxiliary feedwater, the applicant should identify it and verify that Category 1 instrumentation monitors its availability. The applicant has Category 3 instrumentation for the condensate storage tank water level. Category 3 instrumentation is sufficient for the condensate storage tank water level instrumentation when using another source of auxiliary feedwater.

The applicant did not document the primary source of auxiliary feedwater, but did indicate that they monitor the auxiliary feedwater valves position with Category 1 instrumentation. The applicant should identify the primary source of auxiliary feedwater and verify that its operation is monitored by Category 1 instrumentation.

3.3.20 Heat Removal by Containment Fan Heat Removal System

Regulatory Guide 1.97 recommends plant specific Category 2 instrumentation for this variable. The applicant identified Category 3 instrumentation to monitor the containment cooling valve status. The applicant has Category 2 fan status instrumentation, however, this cannot inform the operator that the cooling units have water circulation. The applicant should upgrade the containment cooling valve status instrumentation to Category 2 requirements.

3.3.21 Containment Atmosphere Temperature

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of 40°F to 400°F. The instrumentation provided by the applicant for this variable has a range of zero to 350°F.

The applicant states that the maximum post-accident temperature expected is following a steamline break. This peak containment temperature is 327°F. Based on this limit, we find the zero to 350°F range acceptable.

3.3.22 Containment Sump Water Temperature

The applicant uses alternate instrumentation for this variable. In the recirculation mode, the residual heat removal (RHR) system takes suction from the containment sump. The RHR pumps discharge into the RHR heat exchangers. Sump temperature indication is available in the control room by monitoring the RHR heat exchanger inlet temperature. Category 2 instrumentation monitors this temperature.

The RHR water temperature at the heat exchanger inlet will be the same as the sump temperature. Therefore, we find this alternate instrumentation acceptable.

3.3.23 Makeup Flow-In

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. The applicant's instrumentation is Category 3. The applicant states that the chemical and volume control system (CVCS) makeup is the normal charging flow path. The CVCS automatically isolates with a safety injection signal.

Regulatory Guide 1.97 recommends this instrumentation for monitoring the CVCS. Based on the information provided, the CVCS isolates post-accident. Therefore, we find the instrumentation provided acceptable.

3.3.24 Letdown Flow-Out

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. The applicant's instrumentation is Category 3. The applicant states that the chemical and volume control system (CVCS) letdown isolates post-accident. This automatic isolation occurs with a safety injection signal, a low pressurizer level signal, or a phase A isolation signal. Thus, there is no letdown flow in post-accident operations.

As an accident signal isolates letdown, and no letdown flow occurs post-accident, we find the instrumentation provided acceptable.

3.3.25 Volume Control Tank Level

Regulatory Guide 1.97 recommends Category 2 instrumentation for this variable. The applicant's instrumentation is Category 3. The CVCS automatically isolates with a safety injection signal.

The regulatory guide recommends a range from the top to the bottom of the tank. The span monitored is actually 70 inches. While the tank is longer than this, only ten inches of the cylindrical portion of the tank is not measured.

The range supplied covers 7/8 of the straight cylindrical shell. The instrument does not monitor the hemispherical ends of the tank where the volume to level ratio is not linear. Based on this, and the fact that this system automatically isolates for accident response, and not used post-accident, we find the instrumentation provided acceptable.

3.3.26 Component Cooling Water Temperature to Engineered Safety Features System

Regulatory Guide 1.97 recommends a range of 32°F to 200°F for this variable. The applicant's instrumentation has a range of 50°F to 150°F.

The applicant states that the lowest temperature for this system is 60°F, 10°F above the minimum limit of the range. The applicant also states that the highest temperature anticipated is 120°F, 30°F less than the maximum limit of the range. Based on the applicant's justification, we find the 50°F to 150°F range acceptable.

3.3.27 High-Level Radioactive Liquid Tank Level

Regulatory Guide 1.97 recommends instrumentation for this variable with a range from the bottom to the top of the tank. The applicant monitors from 11 inches to 133 inches (above the tank bottom) in the tritiated drain collector tank.

Each end of the tank has an unmonitored volume of approximately 1000 gallons. This is out of a total volume of 24,700 gallons. Thus, the instrumentation for the tank volume monitors 92 percent of the tank. We find this deviation in range minor and acceptable.

3.3.28 Radioactive Gas Holdup Tank Pressure

Regulatory Guide 1.97 recommends instrumentation with a range of zero to 150 percent of design pressure for this variable. This instrumentation measures from zero to 150 psig. 150 psig is the design pressure of these tanks.

Pressure relief valves operate to keep the pressure from exceeding 150 psig. This is the limit of the instrument range. Because the system design keeps the pressure within the instrument range, we find the provided zero to 150 psig range acceptable.

3.3.29 Noble Gases -- Auxiliary Building

Regulatory Guide 1.97 recommends instrumentation for this variable to monitor releases to the atmosphere. The regulatory guide recommends a range of 10^{-6} microcuries/cc to 10^{3} microcuries/cc. The applicant's instrumentation has a range of 10^{-6} microcuries/cc to 10^{-2} microcuries/cc.

The applicant states that all discharge paths into the auxiliary building automatically isolate before exceeding the instrument range. Upon isolation, the auxiliary building gas treatment system activates. Based on the described system design, we find the range provided acceptable.

3.3.30 Particulates and Halogens

Regulatory Guide 1.97 recommends instrumentation with a range of 10^{-3} microcuries/cc to 10^{2} microcuries/cc for all identified release points. The applicant identified a range of 10^{-9} microcuries/cc to 10^{-4} microcuries/cc for the auxiliary building instrumentation.

The applicant states that the auxiliary building discharge path automatically isolates before exceeding the range. Upon isolation, the auxiliary building gas treatment system activates. Additional laboratory analysis of collected samples is available. Based on the described system design, we find the provided range acceptable.

3.3.31 Radiation Exposure Meters

Revision 2 of Regulatory Guide 1.97 recommended continuous indications at fixed locations for this variable. The licensee is not providing instrumentation for this variable at the Watts Bar Station. Revision 3 of the regulatory guide deletes this variable. Because of this, it is acceptable to delete this variable from the applicant's program for Regulatory Guide 1.97.

3.3.32 Wind Speed

Revision 2 of Regulatory Guide 1.97 recommends wind speed instrumentation with a range of zero to 67 miles per hour. The applicant has wind speed instrumentation that reads from zero to 50 miles per hour. This conforms to the recommendations of Revision 3 of the regulatory guide and is acceptable.

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

Regulatory Guide 1.97 recommends sampling and onsite analysis capability for the reactor coolant system, containment sump, emergency core cooling system pump room sumps, other auxiliary building sump liquids, and containment air.

The applicant's post-accident sampling system deviates from the recommendations of the regulatory guide in the following areas:

1. chloride concentration can resolve down to 1 part per million rather than zero.
2. dissolved hydrogen concentration can resolve down to 10 cc/kg rather than zero.
3. dissolved total gas concentration can resolve down to 10 cc/kg rather than zero.

4. boron concentration can resolve down to 50 parts per million rather than zero

5. hydrogen content of the containment atmosphere can resolve up to 10 percent rather than 30 percent.

6. oxygen content of the containment atmosphere is not determined.

The NRC reviewed and approved the applicant's post-accident sampling facility as part of their review of NUREG-0737, Item II.B.3. We find this a good faith attempt to meet NRC requirements (as defined in NUREG-0737, Supplement No. 1, Section 3.7 [Reference 3]) and, therefore, acceptable.

3.3.34 Recording of Category 1 Instrumentation

Regulatory Guide 1.97 recommends recording all Category 1 variables. Dedicated recorders should be used when direct or immediate trend or transient information is essential for operator information or action. Computer recording, if continuously updated, or intermittent devices, such as data loggers or scanning recorders, can be used if no significant loss of transient response information occurs with such a device.

The applicant states that all Category 1 variables will have at least one channel recorded by Category 2 recorders. Thus, the recorders do not satisfy the Category 1 criteria. The applicant has not identified Category 1 isolation devices between the Category 1 instrument loops and the Category 2 recorders. The applicant has not justified this deviation. The applicant should provide information to show compliance with the recording recommendations of Regulatory Guide 1.97.

3.3.35 Isolation Devices for Category 2 Instrumentation

Regulatory Guide 1.97 recommends that Category 2 signals transmitted to other use be transmitted through Category 2 isolation devices. The applicant lists this requirement as not applicable. It is not clear that the applicant

satisfies this recommendation or whether no Category 2 signals interface other systems.

The applicant should clarify that their use of isolation devices complies with the recommendations of Regulatory Guide 1.97.

3.3.36 Display Locations

Regulatory Guide 1.97 recommends post-accident plant variables for the control room operating personnel. Watts Bar has several variables that do not indicate in the control room.

Variable	Display Location
containment sump water level -- narrow range	technical support center
120-Vac vital inverter current	auxiliary building
120-Vac vital inverter voltage	auxiliary building
pressurizer heater status	technical support center
steam generator power operated relief and safety valve status	technical support center
condenser air ejector flow rate	technical support center
wind direction	technical support center
wind speed	technical support center
estimation of atmospheric stability	technical support center

The applicant has not justified the deviation in the display location. The applicant should either display this information in the control room or provide justification for each variable displayed in locations other than the control room.

4. CONCLUSIONS

Based on our review, we find that the applicant either conforms to or is justified in deviating from the guidance of Regulatory Guide 1.97 for each variable, with the following exceptions.

1. radiation exposure rate -- The applicant should describe instrumentation for this variable. Where deviations exist from the recommendations of the regulatory guide, the applicant should either justify those deviations or upgrade that instrumentation to bring compliance. See Section 3.3.9

* 2. accumulator tank level and pressure -- The applicant should designate either level or pressure as the key variable, and upgrade that instrumentation to Category 2 criteria. If level is the key variable, then the applicant should expand its range to the 10 percent to 90 percent range recommended by the regulatory guide. See Section 3.3.11.

3. quench tank temperature -- The applicant should expand the range of this instrumentation to include saturated steam conditions of approximately 350°F. See Section 3.3.15.

4. auxiliary feedwater flow -- The applicant should clarify the instrumentation provided for this variable, and show that each channel has a range that covers to at least 110 percent of the design flow at the transmitter location. See Section 3.3.18.

5. condensate storage tank level -- The applicant should identify the primary source of auxiliary feedwater and verify that Category 1 instrumentation monitors its operation. See Section 3.3.19.

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* NRC staff note: The staff is currently generically reviewing the need for environmentally qualified Category 2 instrumentation to monitor accumulator tank level and pressure. The staff will report on this later.

6. heat removal by containment fan heat removal system -- The applicant should upgrade the containment cooling valve status instrumentation to Category 2 requirements. See Section 3.3.20.

7. recording of Category 1 instrumentation -- The applicant should provide information to show compliance with the recording recommendations of Regulatory Guide 1.97. See Section 3.3.34.

8. isolation devices for Category 2 instrumentation -- The applicant should clarify that their use of isolation devices complies with the recommendations of Regulatory Guide 1.97. See Section 3.3.35.

9. display locations -- The applicant should either display this information in the control room or provide justification for each variable displayed in locations other than the control room. See Section 3.3.36.

5. REFERENCES

1. Letter, NRC (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 the 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. Letter, Tennessee Valley Authority (L. M. Mills) to NRC (E. Adensam), January 30, 1984.

5. Letter, Tennessee Valley Authority (R. H. Shell) to NRC (E. Adensam), April 16, 1985.

6. Letter, Tennessee Valley Authority (E. G. Wallace) to NRC, "Watts Bar Nuclear Plant (WBN) Units 1 and 2 - Conformance to Regulatory Guide (RG) 1.97, Revision 2 (TAC No.63645)," August 31, 1990.

7. Letter, Tennessee Valley Authority (E. G. Wallace) to NRC, "Watts Bar Nuclear Plant (WBN) - NUREG 0737 Item II.F.1 - Additional Accident Monitoring Instrumentation (TAC 63645)," October 11, 1990.

8. Letter, Tennessee Valley Authority (E. G. Wallace) to NRC, "Watts Bar Nuclear Plant (WBN) - NUREG 0737 Item II.F.1(2), Sampling and Analysis of Plant Effluents - License Condition (LC) 6b," January 3, 1991.

9. 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.

Distribution

Docket File	
NRC PDR	
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