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CONFORMANCE TO REGULATORY GUIDE 1.97  
SOUTH TEXAS PROJECT, UNIT NOS. 1 AND 2

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#### ABSTRACT

This EG&G Idaho, Inc., report reviews the submittal for Regulatory Guide 1.97, Revision 2, for Unit Nos. 1 and 2 of the South Texas Project 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 RG 1.97," being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Regulation, Division of Systems Integration, by EG&G Idaho, Inc., NRC Licensing Support Section.

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Docket Nos. 50-498 and 50-499

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CONTENTS

ABSTRACT .....	11
FOREWORD .....	11
1. INTRODUCTION .....	1
2. REVIEW REQUIREMENTS .....	2
3. EVALUATION .....	4
3.1 Adherence to Regulatory Guide 1.97 .....	4
3.2 Type A Variables .....	4
3.3 Exceptions to Regulatory Guide 1.97 .....	5
4. CONCLUSIONS .....	16
5. REFERENCES .....	20

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## 1. INTRODUCTION

On December 17, 1983, Generic Letter No. 82-33 (Reference 1) was issued by D. G. Eisenhut, Director of the Division of Licensing, Nuclear Reactor Regulation, to all licensees of operating reactors, applicants for operating licenses and holders of construction permits. This letter included additional clarification regarding Regulatory Guide 1.97, Revision 2 (Reference 2) relating to the requirements for emergency response capability. These requirements have been published as Supplement No. 1 to NUREG-0737, "TMI Action Plan Requirements" (Reference 3).

Houston Lighting and Power Company, the applicant for the South Texas Project, Unit Nos. 1 and 2, provided a response to Section 6.2 of the generic letter on September 25, 1984 (Reference 4).

This report provides an evaluation of that submittal.

1 DRAFT

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## 2. REVIEW REQUIREMENTS

Section 6.2 of NUREG-0737, Supplement No. 1, sets forth the documentation to be submitted in a report to NRC describing how the applicant 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

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

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### 3. EVALUATION

The applicant provided a response to Section 6.2 of NRC Generic Letter 82-33 on September 25, 1984. This evaluation is based on that submittal.

#### 3.1 Adherence to Regulatory Guide 1.97

The applicant states that their submittal provides a detailed account of the conformance of the South Texas Project, Unit Nos. 1 and 2, to the recommendations of Revision 2 of Regulatory Guide 1.97. The applicant further states that the information provided in their submittal meets the requirements of Supplement No. 1 to NUREG-0737, Section 6. 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 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. Reactor coolant system (RCS) pressure
2. RCS hot leg water temperature
3. RCS cold leg water temperature
4. Steam generator level (wide range)
5. Steam generator level (narrow range)
5. Pressurizer level

4 DRAFT

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7. Containment pressure
8. Steamline pressure
9. Refueling water storage tank (RWST) level
10. Containment water level (wide range)
11. Containment water level (narrow range)
12. Auxiliary feedwater storage tank level
13. Auxiliary feedwater flow
14. Containment radiation level (high range)
15. RCS pressure
16. Steam generator blowdown radiation monitor
17. Steamline radiation monitor
18. Core exit temperature
19. RCS subcooling

Except as noted in Section 3.3 the above variables 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 from Regulatory Guide 1.97. These are discussed in the following paragraphs.

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### 3.3.1 Range Requirement Deviation

The applicant indicates that the following variables conform to the range recommended by Regulatory Guide 1.97. However, the range provided for each variable is listed as 0 to 100 percent of span. Based on this information we are unable to determine that the range meets the regulatory guide recommendation.

1. Steam generator level (wide range)  
(from tube sheet to separators)
2. Steam generator level (narrow range)  
(no specific requirement)
3. Pressurizer level  
(bottom to top)
4. Refueling water storage tank  
(top to bottom)
5. Auxiliary water storage tank  
(top to bottom)
6. Auxiliary feedwater flow  
(0 to 110 design flow)
7. Volume control tank level  
(top to bottom)
8. Main feedwater flow  
(0 to 110 percent design flow)
9. Containment spray flow  
(0 to 110 percent design flow)

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10. Component cooling water flow to emergency safety features  
(ESF) system components  
(0 to 110 percent design flow)
11. Residual heat removal (RHR) system flow  
(0 to 110 percent design flow)
12. Unit vent flow  
(0 to 110 percent design flow)

The applicant has not provided the range information required by Section 6.2 of Supplement No. 1 to NUREG-0737. The applicant should provide the required information, identify any deviation from Regulatory Guide 1.97 and justify those deviations identified.

#### 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 applicant has not provided the information required by Section 6.2 of Supplement No. 1 of NUREG-0737.

The applicant should provide the required information, identify any deviation from Regulatory Guide 1.97 and justify those deviations identified.

#### 3.3.3 Reactor Coolant System Cold and Hot Leg Temperature

Revision 2 of Regulatory Guide 1.97 recommends instrumentation for these variables with ranges of 50 to 750°F. The applicant has supplied instrumentation for these variables with ranges from 0 to 700°F. The applicant presented no justification for these deviations.

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Revision 3 of Regulatory Guide 1.97 (Reference 5) recommends a range of 50 to 700°F for these variables. The instrumentation supplied by the applicant meets this range. Therefore, the range supplied by the applicant for these variables is acceptable.

#### 3.3.4 Core Exit Temperature

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of 200°F to 2300°F. The applicant is installing instrumentation for this variable with a range of 100°F to 2200°F and has not identified this as a deviation.

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.

#### 3.3.5 Coolant Level in Reactor

Regulatory Guide 1.97 recommends instrumentation for this variable with a range from the bottom of the core to the top of the vessel. The applicant is installing instrumentation for this variable with a range from the upper core support plate to the top of the vessel and has not identified this as a deviation.

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.

#### 3.3.6 Containment Isolation Valve Position

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. The applicant does not consider this instrumentation to be a key variable to indicate whether plant safety functions are being accomplished. The applicant states that this variable is designated for monitoring gross breach of the containment and is qualified to Category 2 criteria.

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We are unable to determine from the applicants submittal just where the provided instrumentation deviates from Category 1 criteria. The applicant should provide Category 1 instrumentation for this variable or identify and justify the specific deviation.

### 3.3.7 Radiation Level in Circulating Primary Coolant

The applicant uses the post-accident sample system to measure this parameter. 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 Analysis of Primary Coolant (Gamma Spectrum)

The applicant has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable.

The applicant should provide the required information, identify any deviation from Regulatory Guide 1.97 and justify those deviations identified.

### 3.3.9 Radiation Exposure Rate (Type C)

Regulatory Guide 1.97, Revision 2, recommends Category 2 instrumentation for this variable as an indication of breach. The applicant has provided Category 3 instrumentation.

Regulatory Guide 1.97, Revision 3, (Reference 5) eliminates this variable as an indicator of breach. Therefore, the existing instrumentation is acceptable.

### 3.3.10 Radiation Exposure Rate (Type E)

Regulatory Guide 1.97, Revision 2, recommends Category 2 instrumentation for this variable. The applicant has provided Category 3 instrumentation.

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Regulatory Guide 1.97, Revision 3, recommends Category 3 instrumentation for this variable. Therefore, the provided instrumentation is acceptable to monitor this variable.

### 3.3.11 Residual Heat Removal (RHR) Heat Exchanger Outlet Temperature

The applicant has supplied instrumentation for this variable with a range of 50 to 400°F. Regulatory Guide 1.97, Revision 2, recommends a range of 32 to 350°F and Revision 3 recommends a range of 40 to 350°F. The low end of the range deviates from both revisions of the regulatory guide.

This deviation is less than 3 percent of the current maximum recommended range. Considering instrument accuracy and the overall range, we consider this deviation minor and, therefore, acceptable.

### 3.3.12 Accumulator Tank Level and Pressure

The applicant indicates conformance for accumulator tank pressure. However, a range of 0 to 700 psig has been supplied while the regulatory guide recommends a range of 0 to 750. The applicant should provide justification for this deviation.

The applicant indicates that there is no level indication provided for this variable. The applicant states that accumulator pressure and valve position indication provide adequate status of the accumulators.

This justification is unacceptable as the applicant has not shown an alternative method for determining the amount of water injected by the accumulators. The applicant should provide level indication in accordance with Regulatory Guide 1.97.

### 3.3.13 Accumulator Isolation Valve Position

The applicant has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737.

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The applicant should provide the required information, identify any deviation from Regulatory Guide 1.97 and justify those deviations identified.

#### 3.3.14 Boric Acid Charging Flow

The applicant does not have instrumentation for this variable. The applicant states that the units do not have boric acid charging flow as a post-accident safety injection system. Refueling water storage tank (RWST) level, high head safety injection (HHSI) flow, low head safety injection (LHSI) flow, containment water level, and emergency core cooling system (ECCS) valve status are the safety injection variables monitored.

Because this is not a safety injection flow at this station, we find that this variable is not applicable.

#### 3.3.15 Reactor Coolant Pump Status

Regulatory Guide 1.97 recommends Category 2 motor current instrumentation to monitor this variable. The applicant has provided on/off indication that except for environmental qualification meets Category 2 requirements. No justification for these deviations was submitted.

Dependent on the accident conditions, the reactor coolant pumps may or may not be operating. When they are operating the motor current is a valuable aid to the operator in diagnosing approach to cavitation, pump seizure and shaft break conditions. As this information can be valuable in mitigating the consequence of an accident, we recommend that the applicant install the recommended instrumentation.

#### 3.3.16 Pressurizer Heater Status

Regulatory Guide 1.97 recommends electric current indication to monitor this variable. The applicant has provided open/closed indication

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for the heater circuit breakers. The applicant states that heater circuit breaker position was selected for determining pressurizer heater status due to hardware considerations.

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.

3.3.17 Quench Tank Level  
Quench Tank Temperature  
Quench Tank Pressure

The applicant has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737.

The applicant should provide the required information, identify any deviation from Regulatory Guide 1.97 and justify those deviations identified.

3.3.18 Containment Atmosphere Temperature

The applicant has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737. The applicant states that their emergency response guidelines do not require the operator to take actions that would result in adverse consequences if the containment temperature was indicating an erroneous value. We assume by this that the instrumentation provided for this variable does not satisfy the recommendations of Regulatory Guide 1.97.

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This is insufficient justification for this deviation. The applicant should provide the required information, identify any deviations from Regulatory Guide 1.97 and justify those deviations identified.

3.3.19 Containment Sump Water Temperature

The applicant has not provided this instrumentation. The applicant states that other parameters were designated as Type D variables to demonstrate that the safety injection systems are operating properly when taking suction from the containment sump.

This justification is not adequate. The applicant should provide the recommended instrumentation for the functions outlined in Regulatory Guide 1.97 or identify other instruments that provide the same quantitative information and satisfy the regulatory guide.

3.3.20 High-Level Radioactive Liquid Tank Level

Radioactive Gas Holdup Tank Pressure

The applicant has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for these variables.

The applicant should provide the required information, identify any deviations from Regulatory Guide 1.97 and justify those deviations identified.

3.3.21 Emergency Ventilation Damper Position

Regulatory Guide 1.97 recommends Category 2 instrumentation that provides open-closed status of the emergency ventilation dampers. The applicant does not provide this instrumentation. Instead, the applicant monitors radiogas, radioparticulate, and radiohalogen concentrations at

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various locations in the plant. The applicant states that this instrumentation provides information concerning the status of the ventilation systems.

The applicant's justification for this deviation is unacceptable. Emergency damper position is recommended by Regulatory Guide 1.97 in addition to monitoring of the flow paths specified by the applicant. The applicant should commit to the installation of Category 2 open/closed instrumentation for this variable.

3.3.22 Vent from Steam Generator Safety Relief Valves or Atmospheric Dump Valves

The applicant has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable.

The applicant should provide the required information, identify any deviation from Regulatory Guide 1.97 and justify those deviations identified.

3.3.23 Radiation Exposure Meters

The applicant has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable.

Revision 3 of Regulatory Guide 1.97 deletes this variable. Therefore, we find it acceptable that the applicant does not have this instrumentation.

3.3.24 Plant and Environs Radiation (Portable Instrumentation)

Regulatory Guide 1.97 recommends instrumentation for this variable with a range of  $10^{-3}$  to  $10^4$  R/hr, photons and  $10^{-3}$  to  $10^4$  rads/hr, beta radiation and low energy photons. The applicant has indicated that the range for this instrumentation is not applicable.

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The applicant should provide the range of this instrumentation, identify any deviation from Regulatory Guide 1.97 and justify those deviations identified.

3.3.25 Plant and Environs Radioactivity (Portable Instrumentation)

The applicant has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737. The applicant should provide the required information, identify any deviation from Regulatory Guide 1.97 and justify those deviations identified.

3.3.26 Wind Direction

Wind Speed

Estimation of Atmospheric Stability

The applicant states that the instrumentation for these variables meets the requirements of Regulatory Guide 1.23.

The applicant has not provided the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for these variables. The applicant should provide the required information, identify any deviation from Regulatory Guide 1.97 and justify those deviations identified.

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#### 4. CONCLUSIONS

Based on our review, we find that the applicant either conforms to or is justified in deviating from Regulatory Guide 1.97, with the following exceptions:

1. Range requirement deviation--the applicant should provide the range monitored for the twelve variables listed and justify any deviation from the regulatory guide (Section 3.3.1).
2. RCS soluble boron concentration--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.2).
3. Containment isolation valve position--the applicant should provide Category 1 instrumentation for this variable or identify and justify any specific deviation (Section 3.3.6).
4. Analysis of primary coolant (gamma spectrum)--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.8).
5. Accumulator tank level and pressure--the applicant should justify the deviation in the pressure range; the applicant should install accumulator tank level instrumentation that meets the recommendations of Regulatory Guide 1.97 (Section 3.3.12).
6. Accumulator isolation valve position--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.13).

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7. Reactor coolant pump status--the applicant should install the motor current instrumentation in accordance with Regulatory Guide 1.97 (Section 3.3.15).
8. Pressurizer heater status--the applicant should provide the recommended instrumentation (Section 3.3.16).
9. Quench tank level--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.17).
10. Quench tank temperature--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.17).
11. Quench tank pressure--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.17).
12. Containment atmosphere temperature--the applicant should provide the information required by Supplement No. 1 to Section 6.2 of NUREG-0737 for this variable (Section 3.3.18).
13. Containment sump water temperature--the applicant should provide the recommended instrumentation for this variable or identify other instrumentation that provides the same information (Section 3.3.19).
14. High-level radioactive liquid tank level--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.20).

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15. Radioactive gas holdup tank pressure--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified. (Section 3.3.20).
16. Emergency ventilation damper position--the applicant should provide position indication for these dampers in accordance with the recommendations of Regulatory Guide 1.97 (Section 3.3.21).
17. Vent from steam generator safety relief valves or atmospheric dump valves--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG--0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.22).
18. Plant and environs radiation--the applicant should provide the range of the instrumentation provided for this variable, identify any deviation and justify those deviations identified (Section 3.3.24).
19. Plant and environs radioactivity--the applicant should provide the information required by Section 6.2 of Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.25).
20. Wind direction--the applicant should provide the information required by Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.26).
21. Wind speed--the applicant should provide the information required by Supplement No. 1 to NUREG-0737 for this variable, identify any deviation and justify those deviations identified (Section 3.3.26).

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22. Estimation of atmospheric stability--the applicant should provide the information required by Supplement No. 1 to NUREG--0737 for this variable, identify any deviation and justify those deviation identified (Section 3.3.26).

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5. REFERENCES

1. NRC letter, D. G. Eisenhower 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 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. Houston Lighting and Power Company letter, J. H. Goldberg to H. Denton, NRC, "Final Safety Analysis Report Amendment 40" September 25, 1984, ST-HL-AE-1125.
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.

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