DUKE POWER COMPANY
OCONEE NUCLEAR STATION

Response to Supplement 1 To NUREG-0737
Document Revision Transmittal

Revision Number 6

Instructions

Revise Volume 2 as Described Below:

Remove Pages 5-1, 5-2, and 5-3	Insert Page 5-1, Revision 6 through 5-76, Revision 6

5. REGULATORY GUIDE 1.97, REVISION 2 - REVIEW FOR OCONEE NUCLEAR STATION

5.1 INTRODUCTION

This Duke Power Company response addressing Regulatory Guide 1.97, Revision 2 for Oconee Nuclear Station has been formulated as an integral part of the overall company plan to respond to Nuclear Regulatory Commission Generic Letter 82-33, which transmitted Supplement 1 to NUREG-0737 "Requirements for Emergency Response Capability." The overall company plan, as described in Section 2, consists of the following task areas in addition to Regulatory Guide 1.97:

- Control Room Review (CRR)
- Safety Parameter Display System (SPDS)
- Emergency Procedure (EP) upgrade
- Emergency Response Facilities

These other task areas are described in detail in the appropriate section of this response. Figure 2-1 (of Section 2) illustrates the interfaces and relationships between the Regulatory Guide 1.97, Revision 2 review effort and the other task areas in the overall integrated plan.

The Technical Support Center (TSC) and Emergency Operations Facility (EOF) are described in previous documents submitted to the NRC as noted in Section 1.2 and are not specifically addressed in this Regulatory Guide 1.97 section.

5.2 BACKGROUND

Duke Power Company began developing a formal review plan to address Revision 2 of Regulatory Guide 1.97 in January, 1982. This plan is part of the larger integrated plan originated to respond to Nuclear Regulatory Commission Generic Letter 82-33. The formal Regulatory Guide 1.97 Revision 2 review plan was established in June, 1982.

5.3 SCOPE

This document contains Duke Power Company's report on the compliance of Oconee Nuclear Station with NUREG-0737 Supplement 1 which references U. S. Nuclear Regulatory Commission Regulatory Guide 1.97, Revision 2 issued in December 1980. Included in the report are descriptions of the Duke Power Company accident monitoring instrumentation position and a detailed comparison table as requested in Supplement 1 to NUREG-0737.

5.4 PLAN DESCRIPTION

The plan for addressing Regulatory Guide 1.97, Revision 2 for the Oconee Nuclear Station design consists of the following three phases:

- Review
- Assessment
- Implementation

The Review phase consisted of the establishment of plant specific accident monitoring instrumentation requirements and a detailed review of existing instrumentation versus these requirements. The plant specific accident monitoring instrumentation criteria and clarifications are established in a Duke Power position statement (see Section 5.5) in addition to Section 7.5 of the Oconee Final Safety Analysis Report (FSAR).

The Station Emergency Procedures and Safety Parameter Display System (SPDS) Critical Safety Functions, both of which are undergoing final review as part of the overall Emergency Response Capability effort, served as inputs for variable selection.

Modifications in the Safety Parameter Display System Critical Safety Functions will be incorporated as appropriate into the Regulatory Guide 1.97 accident monitoring instrumentation in accordance with the integrated plan for addressing Supplement 1 to NUREG-0737.

Emergency Procedures provide the lead guidance for selection of Type A variables. The SPDS Critical Safety Functions form the basis for selection of the Type B and C variables. The Type D and E variables are selected on the basis of individual plant specific system design requirements.

The station Emergency Procedures and the Safety Parameter Display System are discussed in more detail in Sections 6.0 and 4.0 of this response.

The Review phase provided the basis for the Duke position statement on accident monitoring and a listing of variances of installed accident monitoring instrumentation versus the plant specific needs. These variances were reviewed by the appropriate parties as provided for in the interfaces set up by the integrated plan described in Section 2.0, "Integrated Plan and Schedule."

The Assessment phase utilized the input generated during the Review phase and consisted of an evaluation of all identified variances in accident monitoring instruments to determine what further action was merited. Guidance from the NUTAC committee's report on Regulatory Guide 1.97 (Accident Monitoring Instrumentation) Implementation Guideline was considered in development of the comparison sheets. Control Room and operator interfaces were coordinated with the Control Room Review as described in Section 2. The Assessment phase produced two primary end products, specifically, the results of the evaluation described above and this response report for submittal to the NRC.

The Implementation phase of the plan consists of designing and installing those modifications to accident monitoring instrumentation as identified in the Assessment phase. This phase is an integrated effort to insure effective orderly implementation of all Control Room Review, SPDS and RG 1.97 modifications or additions.

Duke Power Company is an active participant in the Nuclear Utility Task Action Committee on Emergency Response Capability, and the resultant NUTAC guidance has been considered and utilized in the review, assessment, and implementation phases of our review plan.

5.5 DUKE POWER COMPANY POSITION ON ACCIDENT MONITORING INSTRUMENTATION

5.5.1 Accident-Monitoring Instrumentation

The criteria and requirements contained in ANSI/ANS-4.5-1980, "Criteria for Accident Monitoring Functions in Light-Water Cooled Reactors," are considered by Duke Power to be generally acceptable for providing instrumentation to monitor variables for accident conditions subject to the clarifications defined below.

5.5.1.1 TYPE A Variables

Type A variables are defined as those variables which are monitored to provide the primary information required to permit the Control Room operator to take specific manually controlled actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for design basis accidents. Primary information is defined as that which is essential for the direct accomplishment of the specified safety functions; it does not include those variables associated with contingency actions which may also be identified in written procedures.

The following variables are those determined to be Type A for Oconee Nuclear Station, as defined above:

- Reactor Coolant System Pressure
- Incore T/C Temperature
- Pressurizer Level
- Degrees of Subcooling
- Steam Generator Level
- Steam Generator Pressure
- Borated Water Storage Tank Level
- High Pressure Injection Flow
- Low Pressure Injection Flow
- Reactor Building Spray Flow
- Reactor Building Hydrogen Concentration
- Upper Surge Tank Level

5.5.1.2 TYPE B ANC C Variables

Type B and C variable selection is based on the SPDS Critical Safety Functions. The SPDS is provided as an aid to the Control Room operating crew in monitoring the status of the Critical Safety Functions. The Critical Safety Functions monitored are those defined in the SPDS Critical Safety Function Fault Trees. The SPDS provides continuous status updated at regular intervals of the Critical Safety Functions.

Since these Critical Safety Functions constitute the basis of the Oconee SPDS, it is Duke Power's position that they should also be identified as the plant safety functions for accident monitoring (i.e., the basis for Type B & C variable selection).

Using the SPDS Critical Safety Functions as the basis for defining the accident monitoring instrumentation incorporates the concept of monitoring the multiple barriers to the release of radioactive material. The Critical Safety Functions monitored are those which assure the integrity of these barriers. The Fault Tree provides an explicit, systematic mechanism for organizing the plant data required to evaluate a Critical Safety Function. The prioritization of the Critical Safety Functions is consistent with the concept of multiple barriers to radiation release.

The Critical Safety Functions are:

- Subcriticality

The subcriticality fault tree monitors the reactor core to assure that it is maintained in a subcritical condition following a successful reactor trip.

- Inadequate Core Cooling

The inadequate core cooling fault tree monitors those variables necessary to evaluate the status of fuel clad heat removal.

- Heat Sink

The heat sink fault tree monitors the ability to transfer energy from the reactor coolant to an ultimate heat sink.

- Reactor Coolant System Integrity

The Reactor Coolant System integrity fault tree monitors those variables indicating a challenge to or a breach of the Reactor Coolant System pressure boundary.

- Containment Integrity

The containment integrity fault tree monitors those variables which would indicate a threat to containment integrity or other undesirable conditions within containment.

- Reactor Coolant System Inventory (RCS)

The RCS inventory fault tree monitors for indications of off-normal quantities of reactor coolant in the primary system.

5.5.1.3 Design and Qualification Criteria

Design and qualification criteria used by Duke Power Company for plant instrumentation are provided below. The category designations are provided for reference to the Regulatory Guide 1.97 (Revision 2) document.

5.5.1.3.1 Design and Qualification Criteria - Category 1

Accident monitoring instrumentation which comprise this design and qualification category are considered by Duke Power to be Nuclear Safety Related and thus are classified as Quality Assurance Condition 1 (QA1).

a. QA1 instrumentation is environmentally qualified as described in the Oconee Nuclear Station IEB-79-01B Duke Power Company submittal and the Resolution of Safety Evaluation Reports for Environmental Qualification of Safety Related Electrical Equipment. Seismic qualification is in accordance with the Oconee Nuclear Station licensing basis as specified in the Oconee FSAR and the Duke Power Seismic Design Criteria (OSDC-0193.01-00-0001).

b. No single failure within either the accident monitoring instrumentation, its auxiliary supporting features, or its power sources, concurrent with the failures that are a condition or result of a specific accident, will prevent the operators from being presented the information necessary to determine the safety status of the plant and to bring the plant to and maintain it in a safe condition following that accident. Where failure of one accident-monitoring channel results in information ambiguity (i.e., the redundant displays disagree) that could lead operators to defeat or fail to accomplish a required safety function, additional information is provided to allow the operators to deduce the actual conditions in the plant. This is accomplished by providing additional independent channels of information of the same variable (an identical channel) or by providing an independent channel to monitor a different variable that bears a known relationship to the multiple channels (a diverse channel). The information provided to the operator to eliminate ambiguity between redundant channels is needed only during a failure of one of the instrument loops. Therefore, it is considered acceptable to use installed instrumentation of equal design and qualification category, installed instrumentation of a lesser design and qualification category, temporary or portable instrumentation, or sampling to allow the operators to deduce the actual conditions in the plant. Redundant QA1 channels are electrically independent and physically separated from each other per the separation criteria described in Chapter 7 of the Oconee FSAR.

At least one channel of QA1 instrumentation is displayed on a direct-indicating or recording device. (Note: Within each redundant division of a safety system, redundant monitoring channels are not needed.)

c. The instrumentation is energized from the safety grade Emergency Power sources (as described in Chapter 8 of the Oconee FSAR) and is backed by batteries where momentary interruption is not tolerable.

d. The instrumentation channel will be available prior to an accident except as provided in Paragraph 4.11, "Exception," as defined in IEEE Standard 279-1971 or as specified in Technical Specifications.

e. The following documents pertaining to quality assurance are referenced:

- Duke 1A — Duke Power Company Topical Report, "Quality Assurance Program"
- Oconee Nuclear Station Final Safety Analysis Report — Chapter 17, "Quality Assurance"

f. Continuous indication display is provided. Where two or more instruments are needed to cover a particular range, overlapping of instrument span is provided.

g. Recording of instrumentation readout information is provided for at least one of the redundant channels. Recorders which are utilized as the primary display device will be seismically qualified. Where direct and immediate trend or transient information is essential for operator information or action, the recording is continuously available on dedicated recorders. Otherwise, it may be displayed on non-seismically qualified recorders or continuously updated, stored in computer memory, and displayed on demand. Intermittent displays such as data loggers and scanning recorders may be used if no significant transient response information is likely to be lost by such devices. All analog variables which are wired to the plant computer may be displayed on trend recorders upon demand to provide hard-copy trend information.

5.5.1.3.2 Design and Qualification Criteria - Category 2

5.5.1.3.2.1 Nuclear Safety Related (QA1) Category 2 Instrumentation

For instrumentation loops that are installed as nuclear safety related (QA1), environmental qualification is provided per the methodology described in the Oconee Nuclear Station IEB 79-01B submittal and the Resolution of Safety Evaluation Reports for Environmental Qualification of Safety Related Electrical Equipment. Seismic qualification is in accordance with the Oconee Nuclear Station Licensing basis as specified in the Oconee FSAR and Duke Power Seismic Design Criteria (OSDC-0193.01-00-0001). Quality Assurance of these QA Condition 1 instrumentation Systems is described in the Duke Power Company Topical Report "Duke 1A" and Oconee FSAR Chapter 17. These instruments are powered from the safety grade Emergency Power sources (as described in Chapter 8 of the Oconee FSAR) and are backed by batteries where a momentary power interruption is not tolerable.

5.5.1.3.2.2 Non Nuclear Safety Related (Non-QA1) Category 2 Instrumentation

For instrumentation loops of lesser importance which are not nuclear safety related, appropriate qualification is provided. Environmental qualification is provided per the methodology described in the Oconee Nuclear Station IEB 79-01B submittal and the Resolution of Safety Evaluation Reports for Environmental Qualification of Safety Related Electrical Equipment.

Category 2 instrumentation which is of primary use during one phase of an accident need not be qualified for all phases of the event. For example, an instrument of primary importance prior to attaining the recirculation mode need not be demonstrated to withstand post-recirculation radiation.

For non-QA1 Category 2 instrumentation, seismic qualification is not required unless seismic induced failure of the instrumentation would unacceptably degrade a safety system.

These instrumentation systems are designed, procured, and installed per Duke Power Company standard practices. Duke Power considers that this is adequate to assure the quality of the subject instrumentation.

Isolation devices are provided to interface between Nuclear Safety Related (QA1) and Non Nuclear Safety Related (non QA1) portions of any of the subject instrumentation loops.

The instrumentation is energized from a highly reliable power source, not necessarily safety grade Emergency Power, and is backed by batteries where momentary interruption is not tolerable.

5.5.1.3.2.3 All Category 2 Instrumentation

For both Nuclear Safety Related and Non Nuclear Safety Related Category 2 instrumentation:

The out-of-service interval should be based on normal Technical Specification requirements for the system it serves where applicable or where specified by other requirements.

The instrumentation signal may be displayed on an individual instrument or it may be processed for display on demand by a CRT or by other appropriate means.

The method of display may be by dial, digital, CRT, or stripchart recorder indication. Effluent radioactivity monitors and meteorology monitors will be recorded. Where direct and immediate trend or transient information is essential for operation information or action, the recording is continuously available on dedicated recorders. Otherwise, it may be continuously updated, stored in computer memory, and displayed on demand.

5.5.1.3.3 Design and Qualification Criteria - Category 3

These instruments do not play a key role in the management of an accident but they do add depth to the Category 1 and 2 instrumentation to the extent that they remain operable. The instrumentation is of high quality commercial grade and is selected to withstand the normal power plant service environment.

The method of display may be by dial, digital, CRT, or stripchart recorder indication. Effluent radioactivity monitors and meteorology monitors will be recorded. Where direct and immediate trend or transient information is essential for operator information or action, the recording is continuously available on dedicated recorders. Otherwise, it may be continuously updated, stored in computer memory, and displayed on demand.

5.5.1.4 Additional Criteria for Categories 1 and 2

In addition to the criteria of Duke Position 5.5.1.3, the following criteria apply to Categories 1 and 2:

- For Nuclear Safety Related (QA1) signals which are transmitted to non-safety related (non QA1) equipment, isolation devices are utilized.

- Dedicated control board displays for the instruments designated as Types A, B, and C, Category 1 or 2 and qualified for use throughout all phases of an accident will be specifically identified on the control panels so that the operator can discern that they are available for use under accident conditions.

5.5.1.5 Additional Criteria for All Categories

In addition to the above criteria, the following criteria apply to all instruments identified in this document:

- Servicing, testing, and calibration programs are specified to maintain the capability of the monitoring instrumentation. For those instruments where the required interval between tests will be less than the normal time interval between generating station shutdowns, the capability for testing during power operation is provided.

- Whenever means for removing channels from service are included in the design, the design facilitates administrative control of the access to such removal means.

- The design facilitates administrative control of the access to setpoint adjustments, module calibration adjustments, and test points.

- The monitoring instrumentation design minimizes the development of conditions that would cause meters, annunciators, recorders, alarms, etc., to give anomalous indications which are potentially confusing to the operator. Human factors guidelines are used in determining type and location of displays. The Duke Control Room Review will make recommendations as to the type and location of displays for added instrumentation.

- To the extent practicable, the instrumentation is designed to facilitate the recognition, location, replacement, repair, or adjustment of malfunctioning components or modules.

- To the extent practicable, monitoring instrumentation inputs are from sensors that directly measure the desired variables.

- To the extent practicable, the same instruments are used for accident monitoring as are used for the normal operations of the plant to enable the operators to use, during accident situations, instruments with which they are most familiar. However, where the required range of monitoring instrumentation results in a loss of necessary sensitivity in the normal operating range, separate instruments are used.

- Periodic checking, testing, calibration, and calibration verification are in accordance with the applicable portions of the Oconee FSAR Chapter 7, "Instrumentation and Controls."

5.5.2 System Operation Monitoring (Type D) and Effluent Release Monitoring (Type E) Instrumentation

5.5.2.1 Definitions

Type D: Those variables that provide information to indicate the operation of individual safety systems.

Type E: Those variables to be monitored as required for use in determining the magnitude of the release of radioactive materials and in continually assessing such releases.

5.5.2.2 Operator Usage

The plant design has included variables and information display channels required to enable the Control Room operating personnel to:

- Ascertain the operating status of each individual safety sytem to the extent necessary to determine if each system is operating or can be placed in operation to help mitigate the consequences of an accident.
- Monitor the effluent discharge paths to ascertain if there have been significant releases (planned or unplanned) of radioactive materials and to continually assess such releases.
- Obtain required information through a backup or diagnosis channel where a single channel may be likely to give ambiguous indication.

5.5.2.3 Design and Qualification Criteria - Types D and E

The design and qualification criteria for safety system operation monitoring (Type D) and effluent release monitoring (Type E) instrumentation are provided in Paragraphs 5.5.1.3, 5.5.1.4, and 5.5.1.5 of this guide.

5.6 REGULATORY GUIDE 1.97 COMPARISON

The following accident-monitoring variable sheets are the result of the Assessment phase of the Regulatory Guide 1.97 Revision 2 review plan. Each sheet contains information regarding the comparison of the particular variable with the recommendations of the Regulatory Guide. Instrument ranges, design, environmental qualification, type of display, and position statements are provided for each variable named in Table 2, "PWR Variables," of Regulatory Guide 1.97 Revision 2. An implementation schedule is also provided if any modifications are planned.

OCONEE NUCLEAR STATION

REGULATORY GUIDE 1.97, REV. 2 REVIEW

COMPARISON OF PLANT SPECIFIC VARIABLES

WITH REGULATORY GUIDE 1.97 REV. 2

OCONEE NUCLEAR STATION

REGULATORY GUIDE 1.97, REV. 2 REVIEW

FORMAT FOR COMPARISON TABLE

	Variable:	This is the variable as listed in Table 2 of RG 1.97, Rev. 2. (The Duke variable name may be shown parenthetically.)
B-16, C-15		This gives the Table 2 of RG 1.97, Rev. 2 variable type and sequence number. Type A variables are those listed in Section 5.5.1.1 of this document.
	Range:	This is the Table 2 of RG 1.97, Rev. 2 listed range.
	Category:	This is the Table 2 of RG 1.97, Rev. 2 listed category.
	Existing Design:	This is a description of the present Oconee design for the instrumentation.
	Compliance:	This is a statement concerning compliance to Duke's interpretation of the recommendations of RG 1.97, Rev. 2.
	Display:	This lists the Control Room indications available to the operator.
	Position:	This is a statement regarding the instruments' adequacy for the intended monitoring function.
	Implementation Schedule:	This lists any schedule information concerning a change to the existing design.

A-1
B-7,
B-11,
C-4,
C-9,

Variable:	RCS Pressure
Range:	0 to 3000 psig
Category:	1
Existing Design:	Oconee has three channels of RCS Pressure instrumentation. All three channels are available on the plant computer. The instrumentation is powered from a highly reliable battery backed source. Two channels are recorded and the range is 0-2500 psig.
Compliance:	This instrumentation is not in compliance with the categorical, environmental or seismic qualifications recommended in RG 1.97, Rev. 2.
Display:	Two channels recorded Three computer points
Position:	Two upgraded QA Condition 1 channels of Wide Range RCS Pressure indication will be installed. These instrumentation loops will be powered from safety grade emergency power sources. The indication readouts will be located in the control room in a mild environment. The range for the readouts will be 0-3000 psig. The control room readout will be through the ICC Monitoring System display. Continuous recording will be provided for one channel. The upgraded instrumentation will be adequate for the intended monitoring function.
Implementation Schedule:	The qualified, upgraded Wide Range RCS Pressure instrumentation will be installed to support the ICC monitoring System as described in the March 10, 1983 Duke Power Company Design Proposal submitted in response to the NRC "Order of December 10, 1982," and the February 28, 1984 letter to the NRC.

A-2
B-8
C-1

Variable: Core Exit Temperature

Range: 200°F to 2300°F

Category: 1

Existing Design: The QA Condition 1 Nuclear Safety Related Core-Exit Thermocouple System for accident monitoring will consist of 24 thermocouples. The primary display will be the plant computer, with a safety related backup display. Inputs to the plant computer for thermocouples used in the backup display will be through qualified isolation devices. Power for the backup display will be from safety grade emergency power sources, and power for the non-safety portion will be a highly reliable battery backed control bus. Redundancy/diversity is provided by the RCS Hot and Cold Leg Temperature instrumentation. Environmental Qualification for the upgraded nuclear safety related portion of the system will be by the methodology described in the Oconee Nuclear Station IEB 79-01B submittal. Seismic qualification for the upgraded nuclear safety related portion of the system will be by the methodology described in the Oconee FSAR Section 3.10 and the Oconee Nuclear Station Seismic Design Criteria (OSDC-0193.01-00-0001). The range of the readouts is 200°F to 2300°F. The plant computer and backup display are installed in a mild environment.

Compliance: The instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.

Display: Primary display will be the plant computer CRTs in the Control Room. The backup display will be a nuclear safety related indicator in the Control Room.

Trend recording of Core Exit Thermocouple temperatures is available through the ICC Monitoring System.

Implementation Schedule: The qualified, upgraded in-containment portion of the Core Exit Thermocouple system will be installed on Oconee Unit 1 during the October 1984 refueling outage. Units 2 and 3 will be implemented during the next refueling outages scheduled for March 1985 and September 1985 respectively. The Nuclear Safety Related backup displays will be added to the system during the outages specified in the March 10, 1983 Duke Power Company Design Proposal submitted in response to the NRC "Order of December 10, 1982," and the February 28, 1984 Duke letter to the NRC. The backup display is part of the plant modifications described in this submittal.

A-3
D-11

Variable: Pressurizer Level

Range: Bottom to top

Category: 1

Existing Design: This station has three redundant channels of pressurizer level instrumentation. Any one of the three channels can be selected and fed to a recorder on the main control board. The indicated range is 0 to 400 inches which represents 11% to 84% level as a percentage of volume. Instrumentation is powered by highly reliable battery backed buses.

Compliance: The range of this instrumentation is not in complete compliance with the recommendations of RG 1.97, Rev. 2. The equipment is not rated to assure survivability for the in-containment accident environment or post-accident radiation exposure.

Display: One channel recorded (selected among the three channels) Three channels on the computer

*Position: In order to determine the range or level that should be monitored for the pressurizer, it is important to understand how the pressurizer is sized and how the level taps are located. The water volume is chosen such that the reactor coolant system can experience a reactor trip from full power without uncovering the level sensors in the lower shell and to maintain system pressure above the HPI system actuation setpoint. The steam volume is chosen such that the reactor coolant system can experience a turbine trip without covering the level sensors in the upper shell. Oconee has a 0 to 400 inch range for measuring pressurizer level based on these criteria. The range allows monitoring to ensure continued safe operation of pressurizer heaters. The installed range of the instrumentation is consistent with B & W NSSS requirements and Duke considers this instrumentation range adequate for the intended monitoring function. At least two qualified QA Condition 1 channels of instrumentation will be added to the existing design. This instrumentation will be powered by the safety grade emergency power sources. Continuous recording will be provided for one channel. The range of the new instrumentation will match the present range which Duke considers adequate for the intended monitoring function.

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97.

A-3
D-11

Variable: Pressurizer Level (Continued)

Implementation Schedule: Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

A-4
B-10

Variable:	Degrees of Subcooling
Range:	200°F Subcooling to 35°F Superheat
Category:	1
Existing Design:	This variable is a computer calculated value using various inputs from the Primary System. A digital display is generated to indicate RCS Loop A, RCS Loop B, and Core Saturation Temperature Margin. The Core Saturation Pressure Margin is also generated and displayed. The displays are located in the Control Room which is a mild environment. These displays and the computer are powered by highly reliable battery backed buses.
Compliance:	This instrumentation is not in compliance with the recommendations of RG 1.97, Rev. 2 for Type A Variables.
Display:	Control Room - Computer driven digital displays Trend recording available on demand
Position:	Two qualified QA Condition 1 channels of Saturation Margin Monitoring (SMM) indication will be installed. One channel will monitor RCS Loop A and the Core Saturation margin while another separate channel will monitor RCS Loop B and the Core Saturation margin. These instrumentation loops will be powered from safety grade emergency power sources. The indication readouts will be located in the control room in a mild environment. This variable will also input to the plant computer through isolation buffers and be available for trend recording upon operator demand. The range of the readouts will be at least 200°F Subcooling to 35°F Superheat. The control room display will be through the ICC Monitoring System. The upgraded instrumentation will be adequate for the intended monitoring function.
Implementation Schedule:	The qualified, upgraded Subcooling Margin Monitoring (SMM) will be installed as part of the ICC Monitoring System described in the March 10, 1983 Duke Power Company Design Proposal submitted in response to the NRC "Order of December 10, 1982." The ICC Monitoring System implementation schedule is described in the March 10, 1983 Duke submittal and the February 28, 1984 Duke letter to the NRC.

A-5
D-16

Variable: Steam Generator Level

Range: From tube-sheet to separators

Category: 1

Existing Design: Oconee has several different methods of Steam Generator (S/G) level measurement and indication. These are summarized below.

1) Start-up range - Four transmitters (two per S/G) feed one dual gauge with ranges of 0" to 250". The four channels are switch selectable for feeding the gauges.

2) Operate range - Four transmitters (two per S/G) are combined with temperature compensation to feed two recorders with ranges of 0" to 400". The four channels are switch selectable for feeding the recorders.

3) Full range - Two transmitters (one per S/G) feed one dual gauge with ranges of 0" to 630".

4) Post Accident range - Four transmitters (two per S/G) feed four gauges with ranges of 0" to 388".

Items 1 thru 3 are used for normal plant operating conditions and are not required, although they may be used as backup verification, for accident conditions. Instrumentation for items 1 thru 3 powered by highly reliable battery backed busses. Instrumentation is not seismically or environmentally qualified.

Item 4 is safety related and is used for post-accident conditions. Instrumentation is powered by safety grade emergency power sources and transmitters are seismically mounted per Oconee FSAR and the Oconee Nuclear Station Seismic Design Criteria OSDC-0193.01-00-0001. Transmitters are environmentally qualified per Oconee Nuclear Station IEB-79-01B submittal.

Compliance: The RG 1.97, Rev. 2 recommended range cannot be met as the Once Through Steam Generator (OTSG) design does not incorporate internal separators.

Display:
- Startup range - one dual gauge
- Operate range - two recorders
- Full range - one dual gauge
- Post-accident range - four gauges
- All channels on the computer (trend recording on demand)

A-5
D-16

Variable: Steam Generator Level (Continued)

Position: During accident conditions, the required range for a B&W once-through steam generator should be based on that level in the steam generator needed to mitigate the effects of a small break LOCA. That range is based on current assumed or known instrumentation errors and is 0" to 120". The installed range of 0" to 388" is adequate during accident conditions for measuring steam generator level and Duke considers the present instrumentation adequate for the intended monitoring function.

Implementation Schedule: Not Applicable.

A-6
D-17

Variable: Steam Generator Pressure

Range: Atmospheric pressure to 20% above lowest safety valve setting.

Category: 1

Existing Design: Each steam generator has two channels of steam generator pressure instrumentation. A duplex gauge is mounted on the main control board for indication of each channel. The indicated range is 0 to 1200 psig corresponding to 14% above the lowest safety valve setting and 8% above the highest safety valve setting. Instrumentation is powered by highly reliable battery backed buses.

Compliance: The range of this instrumentation is not in compliance with the recommendation of RG 1.97, Rev. 2. The equipment is not rated to assure survivability for the in containment accident environment or post-accident radiation exposure.

Display: One duplex indicator (one per S/G)
All channels on the computer (trend recording on demand)

*Position: The main steam lines are provided with safety relief valves, atmospheric dump valves and condenser dump valves to prevent overpressurization of the lines as well as pressure control. Operability of the main steam safety valves ensures that the secondary system pressure will be limited to within its design pressure (1050 psig) during the most severe anticipated system operating transient. With an assumed 3% accumulation when these safety valves are operating, the maximum pressure while they are relieving will be less than 10% above design pressure. Also Technical Specifications limit the maximum allowable plant power and thus steam flow in order to maintain that excess relief capacity. Therefore, based on the facts that the highest safety valve setting is 1104 psig, the steam relief capacity is 17% above the expected steam flow rate and that excess relief capacity is maintained when safety valves are inoperable, the existing range of 0 to 1200 psig is sufficient for this variable. Four QA Condition 1 (two per steam generator) qualified channels of instrumentation will be added to the existing design. This instrumentation will be powered by the safety grade emergency power sources. The new instrumentation will be compatible with the present design range, which is adequate for the Oconee design.

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97.

A-6
D-17

Variable: Steam Generator Pressure (Continued)

Implementation Schedule: Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

A-7
D-8

Variable:	Refueling (Borated) Water Storage Tank Level
Range:	Top to bottom
Category:	1
Existing Design:	The instrumentation for this variable provides continuous display of Borated Water Storage tank level. Two separate channels provide redundant indication of tank level from 0 to 50 feet (13% - 100% of volume). Each channel uses a pneumatic transmitter supplied by the normal Station Air System. A dual unit gauge receives the signals from the transmitters. A separate transmitter supplies an electrical signal to the plant computer.
Compliance:	The instrumentation is not in complete compliance with RG 1.97 recommendations.
Display:	One duplex indicator One channel on the computer (trend recording on demand)
Position:	Two qualified QA Condition 1 channels of instrumentation will be provided, which will be powered by safety grade emergency power sources. Continuous recording will be provided for one channel.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

A-8
D-6

Variable:	Flow in HPI System
Range:	0 to 110% of Design Flow
Category:	1
Existing Design:	One set of instrumentation per train measures HPI flow from 0 to 1200 GPM with a design flow of 525 GPM. The present instrumentation is pneumatic and is supplied by the normal Station Air System. This instrumentation is installed in a mild environment.
Compliance:	This instrumentation is not in compliance with the recommendations of RG 1.97, Rev. 2.
Display	Two indicators (one per train)
Position:	For Oconee this is a Type A variable therefore these instrument loops will be upgraded with redundant, fully qualified QA Condition 1 components, powered by safety grade emergency power sources. The range will be changed to 0 to 1000 GPM per Control Room Design Review recommendations for improved accuracy. Continuous recording will be provided for one channel.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

A-9 D-1 D-7	Variable:	RHR System Flow, Flow in LPI System (Decay Heat Removal System Flow)
	Range:	0 to 110% Design Flow
	Category:	1
	Existing Design:	The Decay Heat Removal Flow instrumentation provides an indicated range of 0 to 6000 GPM. The design flow is 3000 GPM. All instrumentation is pneumatic and is supplied by the normal Station Air System. Two channels are provided for flow in each train (A&B). Documentation is not available to prove qualification of equipment located in harsh environments.
	Compliance:	The range of the instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5. The environmental qualification is not in compliance with the recommendations of RG 1.97, Rev. 2.
	Display:	Two duplex indicators Two computer points
	Position:	Since LPI Flow has been defined as a Type A variable, two new qualified, QA Condition 1 channels will be added to indicate Decay Heat Removal Flow. The new flow instrumentation will be powered by safety grade emergency power sources. Continuous recording will be provided for one channel.
	Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

A-10
D-22

Variable:	Containment (Reactor Building) Spray Flow
Range:	0 to 110% Design Flow
Category:	1
Existing Design:	The Reactor Building Spray Flow instrumentation provides an indicated range of 0 to 2000 GPM. Design flow is approximately 1500 GPM. All instrumentation is pneumatic and is supplied by the normal Station Air System. One channel is provided for each of two spray pumps. Documentation is not available to prove qualification of the equipment located in a harsh environment.
Compliance:	The range of the instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5. The environmental qualification is not in compliance with the recommendations of RG 1.97, Rev. 2.
Display:	One duplex indicator Two computer points
Position:	Two new qualified, QA Condition 1 channels will be added to indicate R. B. spray flow. The new flow instrumentation will be powered by the safety grade emergency power sources. Continuous recording will be provided for one channel.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

A-11
C-10

Variable:	Containment (Reactor Building) Hydrogen Concentration
Range:	0 to 10% Hydrogen
Category:	1
Existing Design:	Two redundant channels of nuclear safety related instrumentation monitor reactor building hydrogen concentration. The indicated range is from 0 to 10% concentration. Both channels are powered by safety grade emergency buses. Control of the sample line switching valves and sample selector solenoid valves is accomplished at the analyzer remote control panel. These instruments are qualified in accordance with the methodology described in the Oconee Nuclear Station IEB 79-01B submittal. The instrumentation is seismically qualified in accordance with the criteria of Oconee FSAR Section 3.10 and the Oconee Nuclear Station Seismic Design Criteria (OSDC-0193.01-00-0001).
Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	Two indicators One channel recorded Two computer points
Position:	The installed instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

A-12
D-21

Variable: Auxiliary Feedwater Condensate Storage Tank Level, Or Auxiliary Feedwater Assured Source

Range: Plant Specific

Category: 1

Existing Design: Oconee's Emergency Feedwater System (EFDW) draws condensate grade suction from the Upper Surge Tanks and the Condenser Hotwell. Condensate may also be provided from the Condensate Storage Tank (CST) and the Makeup Demineralizers. Additional backup of the two normal condensate grade sources is provided by these same locations associated with the other two units. The level transmitters which monitor Upper Surge Tank and Hotwell level are located in the Turbine Building which is a mild environment. These instrumentation loops are powered from highly reliable battery backed power source.

Compliance: The instrumentation presently available for monitoring the assured source for the Emergency Feedwater System does not comply with the recommendations of RG 1.97, Rev. 2.

Display: Category 3 instrumentation is available to monitor these sources in the control room.

Hotwell Level - One continuous recorder
One computer monitoring point

Upper Surge Tank Level - One continuous recorder
Two computer monitoring points

Position: Proposed: Two qualified, QA Condition 1 channels of Upper Surge Tank level indication will be installed. These instrumentation loops will be powered from safety grade emergency power sources. Continuous recording will be provided for one channel. The upgraded instrumentation will be adequate for the intended monitoring function.

Implementation Schedule: Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

B-1

Variable:	Neutron Flux
Range:	10^{-6} to 100% Full Power
Category:	1
Existing Design:	Oconee has two channels of neutron flux for both the source and intermediate ranges. Five neutron flux channels exist for the power range. The indicated ranges are; source range, 10^{-1} to 10^{6} counts per second and -0.5 to +5 decade/min. rate of change; intermediate range, 10^{-11} to 10^{-3} amps and -0.5 to +5.0 decade/min. rate of change; power range, 0 to 125%. The instrumentation is powered by a highly reliable battery backed source. The equipment is designed for the normal containment environment for the safety function of overpower reactor trip. The instrumentation is not environmentally qualified for post-accident operation.
Compliance:	The instrumentation is not in compliance with the RG 1.97, Rev. 2 recommendations for environmental or seismic qualification.
Display:	Thirteen Control Room indicators (Four source, four intermediate, five power) Thirteen computer points (Four source, four intermediate, five power). Trend recording on demand. Three channels recorded, six accessible
Position:	Duke Power will install two qualified, QA Condition 1 channels of full-range neutron flux instrumentation. Power will be from safety grade emergency buses. Continuous recording of one channel will be provided.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

B-2

Variable:	Control Rod Position
Range:	Full in or not full in
Category:	3
Existing Design:	Each control rod's position is indicated on an analog display which has two switchable input modes for the full 0 to 139 inch range. In addition, separate Full In and Full Out indicating lights are provided for each control rod. Analog computer points are provided for each control rod's position and for group 5, 6, 7, and 8 rod position for the full 0 to 139 inch range. This instrumentation is powered from a highly reliable battery backed source.
Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	- Indicating lights for Full In or Not Full In for all control rods. - Analog display full range for all control rods. - Computer inputs for all control rods and control rod groups 5, 6, 7, and 8. Trend recording on demand.
Position:	The installed instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

B-3 Variable: RCS Soluble Boron Concentration

Range: 0 to 6000 ppm

Category: 3

Position: This variable is monitored by sampling and laboratory analysis. Primary system boron concentration is controlled manually with the sampling frequency determined by plant conditions and operating procedures. In addition post-accident sampling of the RCS is available as discussed for variable C-3. Neutron flux indication also provides indication of reactor subcriticality. Duke considers these measures adequate for the intended monitoring functions.

A-4
B-4
B-6

Variable: RCS Cold Leg Water Temperature

Range: 50°F to 750°F

Category: 1

Existing Design: Oconee has indication of RCS Cold Leg Temperature for each of four cold legs. The instrumentation is powered from a highly reliable battery backed source. The indicated range is 50 to 650°F. Additional diversity is provided by the Hot Leg Water Temperature and Core Exit Temperature instruments.

Compliance: The existing design is not in full compliance with RG 1.97, Rev. 2 for environmental and seismic qualification and range.

Display: Two channels recorded
Four computer inputs
Four channels can be trend recorded on demand.

*Position: The RCS Cold Leg Water Temperature is used as a backup for the key variables of Hot Leg Temperature and Core Exit Temperature. Because the Hot Leg and Cold Leg RTD's are located in the RCS loops and not in the reactor vessel, either forced or natural circulation is required through the steam generators for their indication to be representative of actual core conditions. When circulation is present, the 650°F high end of the range provides 18% excess measurement capability based on a S/G design pressure of 1050 psig and a saturation temperature of approximately 553°F for the Oconee design. Because the RCS Cold Leg Water Temperature is not used in the ATOG guidelines and functions as backup to the other two variables, it is appropriate to classify this variable as a Category 3. The existing design is adequate for the intended monitoring function.

Implementation Schedule: Not Applicable.

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97.

B-5

Variable:	RCS Hot Leg Water Temperature
Range:	50°F to 750°F
Category:	1
Existing Design:	Oconee has four RTD's monitoring Wide Range RCS Hotleg Water Temperature. These RTD's are input to the Integrated Control System (ICS). All RTD inputs are available on the plant computer. The RTD's have an indicated range of 50 to 650°F. Diversity for RCS temperature is provided by the Core Exit Thermocouples.
Compliance:	The existing range for this variable is not in full compliance with RG 1.97, Rev. 2.
Display:	Four computer points (trend recording on demand)
Position:	Two qualified, QA Condition 1 channels of Wide Range RCS Hot Leg Water Temperature indication will be installed. These instrumentation loops will be powered from safety grade emergency power sources. The indication readouts will be located in the control room in a mild environment. This variable will also input to the plant computer through isolation buffers and be available for trending upon operator demand. The range of the readouts will be 50°F to 700°F which Duke considers adequate for the intended monitoring function. Also note, this range is in compliance with the recommendations of Revision 3 to RG 1.97. The control room display will be through the ICC Monitoring System. The upgraded instrumentation will be adequate for the intended monitoring function.
Implementation Schedule:	The qualified, upgraded RCS Hot Leg Temperature instrumentation will be installed to support the ICC Monitoring System as described in the March 10, 1983 Duke Power Company Design Proposal submitted in response to the NRC "Order of December 10, 1982," and the February 28, 1984 letter to the NRC.

B-9

Variable:	Coolant Level in Reactor
Range:	Core bottom to vessel top
Category:	1
Proposed Design:	The system design for this variable is described in the March 10, 1983 Duke response to the December 10, 1982 NRC order pertaining to NUREG 0737, Item II.F.2 and the August 25, 1983 Duke response to a NRC request for Information. The system to be installed will consist of two redundant QA Condition 1 Nuclear Safety Related channels. Each channel will monitor from the top of the Hot Leg on each steam generator to a tap on the Decay Heat drop line and from the top of the Reactor Vessel Head to the same Decay Heat drop line tap. Compensation for impulse line temperature variations is provided. Each channel will be powered from redundant safety-grade emergency power sources. Environmental qualification for this system will be per the methodology described in the Oconee Nuclear Station IEB 79-01B submittal. Seismic qualification methodology for this system is described in the Oconee FSAR, Section 3.10 and the Oconee Nuclear Station Seismic Design Criteria (OSDC-0193.01-00-0001).
Compliance:	The instrumentation proposed is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5 and has been accepted as meeting the requirements of NUREG 0737, Item II.F.2.
Display:	Two indicators per channel Hot Leg Level (0 to 100%) Reactor Vessel Head Level (0 to 100%) Two channels on the computer One channel recorded Trending of level measurement is available through the ICC Monitoring System.
Position:	The proposed instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	The schedule for implementing this system on the three Oconee Nuclear Station units is described in the March 10, 1983 Duke submittal and the February 28, 1984 Duke Letter to the NRC.

B-12a
C-6a

Variable:	Containment Sump Water Level Narrow Range
Range:	Narrow Range Level
Category:	2
Existing Design:	Two channels of instrumentation will monitor both the Normal Sump Level (0 to 2 feet, approximately 350 gallons) and the Emergency Sump Level (0 to 3 feet approximately 4000 gallons). The instrumentation will be powered from safety grade emergency power buses. Qualified backup indication is provided by the Wide Range Sump Level instrumentation. This instrument is environmentally qualified as described in the Oconee IEB-79-01B submittal.
Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	Four indicators One channel on the computer (trend recording on demand.) One channel recorded
Position:	The installed instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	The Unit 3 instrumentation is in place. The implementation schedule for Units 1 and 2 has previously been submitted as an item covered under NUREG-0737, Section II.F.1.

B-12b
C-6b

Variable:	Containment Sump Water Level
Range:	Wide Range (Bottom of containment to 600,000 gal. level)
Category:	1
Existing Design:	Two redundant, nuclear safety related level QA Condition 1 transmitters measure containment sump water level from the bottom of containment to approximately five feet above the maximum flood elevation which exceeds the 600,000 gallon level. The indicated range is 0 to 15 feet. Redundancy/ diversity is provided by Borated Water Storage Tank Level and the Narrow Range Sump Level indicators. The instruments are powered by safety grade emergency power buses. Environmental qualification methodology is described in the Oconee IEB-79-01B submittal. The instrumentation is seismically qualified in accordance with the Oconee license basis as specified in the Oconee FSAR and the Duke Power Seismic Design Criteria (OCSD-0193.01-00-0001).
Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	Two indicators Two channels on the computer (trend recording on demand.) One channel recorded
Position:	The installed instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

B-13, B-15, C-5, C-11	Variable:	Containment Pressure (Reactor Building Pressure)
	Range:	10 psig to 3 times Design Pressure (177 psig)
	Category:	1
	Existing Design:	Oconee has two redundant QA Condition 1 channels of instrumentation for monitoring reactor building pressure. This instrumentation is powered by safety grade emergency power buses. Indicated range is -5 to 175 psig with the reactor building design pressure being 59 psig. Environmental qualification is as described in Oconee Nuclear Station IEB 79-01B submittal. The instrumentation is seismically qualified in accordance with the criteria of the Oconee FSAR Section 3.10, and Oconee Nuclear Station Seismic Design Criteria 9OSDC-0193.01-00-0001).
	Compliance:	This instrumentation range is not in full compliance with the recommendation of RG 1.97, Rev. 2.
	Display:	Two indicators Two channels on the computer (trend recording on demand) One channel recorded
	Position:	The installed instrumentation is adequate for the intended monitoring function. The instrumentation range covers nearly 99% of the recommended range. Duke's position is that the indicated range is adequate for accident conditions.
	Implementation Schedule:	Not Applicable.

B-14 Variable: Containment Isolation Valve Position

Range: Closed - Not Closed

Category: 1

Existing Design: All electrically controlled containment isolation valves are provided with control switches on the main control boards. Actual valve position is provided by QA Condition 1 limit switches on the valves which operate both Closed-Not Closed, and Open-Not Open control switch indicating lights. These valves and their control switch indicating lights (with the exception of those discussed below) are powered by safety grade emergency buses. Additional indication is provided on the computer. Redundancy is not necessary on a per valve basis since redundant barriers are provided for all fluid penetrations as discussed in the Oconee FSAR Section 6.2.3.2. Environmental qualification of the limit switches is described in the Oconee IEB-79-01B submittal. The instrumentation is seismically qualified in accordance with the Oconee FSAR Section 3.10 and the Oconee Nuclear Station Seismic Design Criteria (OSDC-0193.01-00-00001)

Compliance: Eighteen electrically controlled containment isolation valves do not have nuclear safety related position indication and therefore do not meet the recommendation of RG 1.97, Rev. 2. Several Reactor Building isolation valves utilize stem-mounted limit switches for position indication. Documentation may not exist to show environmental qualification for some of the limit switches located in harsh environments.

Display: Control switch indicating lights
Computer points
Engineered safeguards indication

Position: All electrical controlled containment isolation valves will be provided with QA Condition 1 position indication in the Control Room. Limit switches which do not have qualification documentation will be upgraded with qualified units.

Implementation Schedule: Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

C-2 Variable: Radiation Level in Primary Coolant

Range: 1/2 Tech Spec limit to 100 times Tech Spec limit

Category: 1

Existing Design: Oconee has one channel of primary coolant radiation level instrumentation. This channel is powered from a highly reliable battery backed bus. The indicated range is 10^1 to 10^6 counts per minute which covers reactor coolant concentrations of approximately 10^{-3} uCi/ml to 10^3 uCi/ml (see the Oconee FSAR, Section 11.5). This monitor is in the Reactor Coolant Letdown Line and is isolated upon an ESF actuation signal.

Compliance: This monitor was not installed as a Category 1 (QA Condition 1) instrument. RG 1.97, Rev. 2 range is not met.

Display: One indicator
One channel recorded
One computer point

*Position: This monitor was not installed to quantify accident conditions and is isolated following an accident. The level of environmental qualification provided for this instrumentation is consistent with its performance expectations and meets the recommendations of Category 3 in Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5. Information for this variable is obtained by sampling and analysis which is considered adequate for the intended monitoring function.

Section II.B.3 of NUREG-0737 requires that the capability exist at each nuclear plant to sample the RCS to assess the magnitude of fuel failures during post-accident conditions. As such, this method should be the primary means of determining clad breach.

Implementation Schedule: Not Applicable.

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97.

C-3
E-18,
E-19

Variable: Analysis of Primary Coolant
Accident Sampling Capability, Primary Coolant and Sump, Containment Air

Range: 10 uCi/gm to 10 Ci/gm or TID 14844 source term in coolant volume Grab Sample

Category: 3

Existing Design: The existing design of the sampling system for the primary coolant, the containment sump and containment air allows samples to be taken for laboratory analysis. Samples from other plant systems including various auxiliary building sumps can be obtained from sample points on system piping and/or storage tanks. Capabilities for making the recommended measurements (some use diluted samples) are provided. Detailed information concerning the Post-Accident Sampling Systems and the laboratory capabilities available at Oconee is described in the NUREG 0737, II.B.3 Post-Accident Sampling System response, transmitted by the December 1, 1982 letter from Hal B. Tucker (Duke Power) to Harold R. Denton, Attention: John F. Stolz on Oconee Nuclear Station, Docket Nos. 50-269, 59-270, and 50-287.

Compliance: Chloride analysis is done off site and might not be available within the time limit provided for in footnote 17 in RG 1.97, Rev. 2.

Display: Not Applicable.

Position: The use of diluted samples is in part for maintaining personnel exposures ALARA and is within the guidelines provided in NUREG 0737 and its clarifications. Duke considers the use of diluted samples in compliance with RG 1.97, Rev. 2. The Criterion 5 of NUREG 0737 allows 96 hours to perform a chloride analysis which will be met by Duke. The 24 hour time limit applies only to BWR's on sea or brackish water sites, and plants which use sea or brackish water in essential heat exchangers. The existing chloride measuring capabilities are considered adequate by Duke. Further discussion of these subjects is contained in the PASS response referenced above.

Implementation Schedule: Not Applicable.

C-7
E-1

Variable:	Containment Area Radiation - High Range
Range:	1 to 10^7 R/hr
Category:	1
Existing Design:	Oconee has two redundant QA Condition 1 channels of containment high range radiation monitoring instrumentation. Each channel is powered by safety grade emergency power. The indicated range is 1 to 10^7 R/hr. Diversity is provided by portable instrumentation or sampling and analysis. Environmental qualification is as described in the Oconee Nuclear Station IEB-79-01B submittal. The instrumentation is seismically qualified in accordance with the Oconee Nuclear Station licensing basis as specified in the Oconee FSAR and the Duke Power Seismic Design Criteria (OCSD-0193.01-00-0001).
Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	Two indicators (one per channel) Two channels on the computer One channel recorded
Position:	The installed instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

C-8, E-6, C-12, C-14, E-3, E-4, E-5, E-9	Variable:	Condenser Air Ejector Effluent Radioactivity Containment Effluent Radioactivity Effluent Radioactivity (from buildings in contact with the containment) Containment Purge Effluent Radioactivity Annulus Effluent Radioactivity Auxiliary Building Effluent Radioactivity Other Identified Release Point Effluent Radioactivity
	Range:	Various - from 10^{-6} to 10^{-2} uCi/cc to 10^{-6} to 10^{5} uCi/cc
	Category:	2
	Existing Design:	Airborne process radiation monitors exist for monitoring ventilation exhausts and the condenser air ejector exhaust (Oconee has no Annulus) (see the Oconee FSAR, Section 11.5 and Table 11.5.2-1). However, in accordance with RG 1.97, Rev. 2 these monitors are not required for accident monitoring due to the fact that ventilation systems and the condenser air ejector exhaust to the common unit vent (see variable sheet E-7 on the unit vent radiation monitor).
	Compliance:	Not Applicable.
	Display:	Not Applicable.
	Position:	Individual radiation monitors are not needed for compliance to the recommendations of RG 1.97, Rev. 2 due to effluents exhausting to the common unit vent.
	Implementation Schedule:	Not Applicable.

C-13, E-2

Variable:	Area Radiation
Range:	10^{-1} R/hr to 10^{4} R/hr
Category:	2
Existing Design:	Oconee has an extensive Area Radiation Monitoring System installed for personnel protection. Channel detector locations were selected based on areas normally having free access and low radiation dose rates with the potential of having abnormal radiation levels. These channels have an indicated range of 10^{-1} to 10^{7} mR/hr. Redundant indication can be provided by portable instrumentation. The channels are powered by a highly reliable battery backed bus. See the Oconee FSAR, Section 12.3.3 Radiation Monitoring System.
Compliance:	The environmental qualification of some of the instrumentation is not in compliance with the recommendations of RG 1.97, Rev. 2.
Display:	One indicator per channel One computer point per channel (trend recording on demand)
Position:	The qualification is within the guidance provided for Category 3 instrumentation which Duke considers adequate for the intended monitoring function. Also note, this is in compliance with the recommendations of RG 1.97, Rev. 3. Continuous recording is not required for the intended monitoring function.
Implementation Schedule:	Not Applicable.

D-2

Variable:	RHR Heat Exchanger Outlet Temperature (Decay Heat Cooler Discharge Temperature)
Range:	32°F to 350°F
Category:	2
Existing Design:	Each train of the Oconee LPI system contains instrumentation to monitor decay heat cooler discharge temperature. The range for this instrumentation is 0° to 300°F, and the power supply is a highly reliable battery backed control bus. Documentation is not available to provide qualification of equipment located in a harsh environment.
Compliance:	The range and the environmental qualification of the instrumentation is not in compliance with the recommendations of RG 1.97, Rev. 2.
Display:	Two channels indicated One annunciator alarm
Position:	The instrumentation will be upgraded to full environmentally qualified (per the IEB-79-01B submittal methodology) instruments. The range will be extended to cover the RG 1.97, Rev. 2 range.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

D-3a

Variable:	Accumulator Tank Level (Core Flood Tank Level)
Range:	10% to 90% volume
Category:	2
Existing Design:	Oconee has two channels of tank level instrumentation on each of the two core flood tanks. Power for these channels is provided by highly reliable battery backed buses. The indicated range is 0 to 14 feet which corresponds to approximately 15% to 83% of the core flood tank volume. The equipment is located in a harsh environment.
Compliance:	The range and environmental qualification of this instrumentation is not in total compliance with the recommendations of RG 1.97, Rev. 2.
Display:	Four indicators (2 indicators per tank) Two computer points (one per core flood tank)
Position:	The primary function of this instrumentation is to monitor the preaccident status of the core flood tanks to assure that this passive safety system is prepared to serve its safety function. The indicated range envelopes the Technical Specification level requirements and Duke Power considers the range adequate to meet the intended monitoring function. This instrumentation plays no significant role in the subsequent management of an accident. Therefore, Core Flood Tank Level is not a key variable for accident monitoring and is considered to be Category 3 instrumentation. The level of environmental qualification provided for the instrumentation in this system is consistent with the performance expectations of the system and meets the recommendations of Category 3 in Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Implementation Schedule:	Not Applicable.

D-3b

Variable:	Accumulator Tank Pressure (Core Flood Tank Pressure)
Range:	0 to 750 psig
Category:	2
Existing Design:	Oconee has two channels of core flood tank pressure instrumentation on each of two core flood tanks. Power for these channels is provided by highly reliable battery backed buses. The indicated range is 0 to 700 psig. The tanks are pressurized to 600 psig under normal operating conditions. Documentation is not available to prove qualification of equipment located in harsh environments.
Compliance:	The range of this instrumentation is not in total compliance with the recommendations of RG 1.97, Rev. 2. Documentation is not available to prove qualification of equipment located in harsh environments.
Display:	Two duplex indicators (two indications per tank) Two computer points (one per tank)
Position:	The primary function of this instrumentation is to monitor the preaccident status of the core flood tanks to assure that this passive safety system is prepared to serve its safety function. This instrumentation plays no significant role in the subsequent management of an accident. Therefore, Core Flood Tank Pressure is not a key variable for accident monitoring and is considered to be Category 3 instrumentation. The installed system meets the Duke interpretation of Category 3 recommendations (as clarified in Section 5.5). The indicated range covers approximately 0 to 117% of the operating pressure of the tanks. Because the purpose of this variable is to monitor and maintain Core Flood Tank pressure during normal operation to Technical Specification (TS) limits, the range of this variable should provide some margin above that TS limit. Since the Oconee TS limit is 600 ± 25 psig, a high range value of about 700 psig will provide greater than 10% excess range measurement capability and will therefore be sufficient. Duke Power considers the instrumentation adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable

D-4

Variable:	Accumulator Isolation Valve Position (Core Flood Tank Isolation Valve Position)
Range:	Closed or Open
Category:	2
Existing Design:	The core flood tank isolation valves are provided with control switches on the main control board. During normal plant operation, power is removed from the valve operators to prevent a spurious signal from inadvertently closing the valves. The indicating lights are powered from a separate highly reliable battery backed bus and give actual valve position of both Closed-Not Closed and Open-Not Open. Documentation is not available to prove qualification of the equipment located in a harsh environment.
Compliance:	The environmental qualification is not in compliance with the recommendations of RG 1.97, Rev. 2.
Display:	Position indicating lights Computer points
Position:	Environmentally qualified limit switches will be provided for the core flood tank isolation valves.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

D-5 Variable: Boric Acid Charging Flow

* Oconee NSSS does not include a charging system as part of the Emergency Core Cooling System (ECCS). Flow paths from the ECCS to the RCS include high pressure injection (HPI) and low pressure injection (LPI) with the BWST or the RB Sump as the suction source, and the Core Flood Tank injection. HPI and LPI flow rates are monitored, and BWST, RB Sump, and Core Flood Tank levels are monitored by RG 1.97 variables. Therefore, Boric Acid Charging Flow monitoring is not applicable to the operation of the ECCS.

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97.

D-9	Variable:	Reactor Coolant Pump Status
	Range:	Motor Current
	Category:	3
	Existing Design:	The indicated range for RCP motor current is from 0 to 1200 amps. The instrumentation derives power from the monitored source.
	Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
	Display:	Four ammeters
	Position:	The installed instrumentation is adequate for the intended monitoring function.
	Implementation Schedule:	Not Applicable.

D-10a

Variable:	Primary System Safety Relief Valve Positions (Power Operated Relief Valves)
Range:	Closed - Not Closed
Category:	2
Existing Design:	An acoustical leak detection monitoring system is the primary instrumentation for determining PORV position. It is a single channel system powered from a highly reliable battery backed bus. It provides the operator with positive indication of valve position by indicating fractional flow through the valve in ten steps from 0.01 to 1.0. Backup indication of PORV position is provided by limit switch operated indicating lights and PORV outlet temperature indication. The system was specified and is rated to operate in all environmental conditions for its location.
Compliance:	Some of the equipment in this system does not have formal environmental qualification as recommended in RG 1.97, Rev. 2.
Display:	One indicator with ten LEDs.
Position:	The existing equipment was purchased and installed prior to completion of testing and qualification by the manufacturer. Although the manufacturer's test plan was adequate to assure qualification for Oconee design basis conditions, the manufacturer was unable to provide a generic industry qualification and canceled the qualification program prior to completion. A new generic qualification program was completed but was not applicable to the Oconee installed equipment, although similar in design. The existing equipment is adequate for the intended monitoring function; however, implementing a qualification program for the undocumented equipment is not economically feasible and those components will be replaced with qualified equipment.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

D-10b

Variable:	Primary System Safety Relief Valve Positions (Code Valves)
Range:	Closed - Not Closed
Category:	2
Existing Design:	Acoustical leak detection monitoring systems are the primary instrumentation for determining code valves position. Each code valve has a single channel system powered from a highly reliable battery backed bus. It provides the operator with positive indication of valve position by indicating fractional flow through the valve in ten steps from 0.01 to 1.0. Backup indication of code valve position is provided by valve outlet temperature indication. The system was specified, and is rated to operate in all environmental conditions for its location.
Compliance:	Some of the equipment in this system does not have formal environmental qualification as recommended in RG 1.97, Rev. 2.
Display:	One indicator with ten LEDs per relief valve
Position:	The existing equipment was purchased and installed prior to completion of testing and qualification by the manufacturer. Although the manufacturer's test plan was adequate to assure qualification for Oconee design basis conditions, the manufacturer was unable to provide a generic industry qualification and canceled the qualification program prior to completion. A new generic qualification program was completed but was not applicable to the Oconee installed equipment, although similar in design. The existing equipment is adequate for the intended monitoring function; however, implementing a qualification program for the undocumented equipment is not economically feasible and those components will be replaced with qualified equipment.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

D-12

Variable:	Pressurizer Heater Status
Range:	Electric Current
Category:	2
Existing Design:	Control indicating lights are used for indication of the ON/OFF status of the pressurizer heater groups. Indicating lights are powered by highly reliable battery backed busses. This monitoring instrumentation is located in a mild environment.
Compliance:	The instrumentation monitors an alternate parameter to the RG 1.97 recommendations.
Display:	ON/OFF indicating lights
*Position:	ON/OFF status of the pressurizer heaters provides the operator adequate information for Design Basis events. Additionally, RCS pressure can be monitored to determine the effectiveness of the heaters to maintain system pressure. Duke feels that this is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97.

D-13

Variable:	Quench Tank Level
Range:	Top to Bottom
Category:	3
Existing Design:	The indicated range of Quench Tank Level is from 0 to 125" corresponding to tank volume of approximately 15 - 96%.
Compliance:	The range is not in complete compliance with RG 1.97 recommendations.
Display:	One indicator One computer point One channel recorded
Position:	Duke indicated range is 15 - 96%. The upper range meets the intended monitoring function. No useful information would be gained by measuring from 0 - 15%. Normal level (pre-accident) is maintained above 15% and post-accident conditions will only increase tank level. Therefore, the existing range is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

D-14

Variable:	Quench Tank Temperature
Range:	50°F to 750°F
Category:	3
Existing Design:	The indicated range of Quench Tank temperature is from 0 to 250°F.
Compliance:	The range is not in compliance with the RG 1.97, Rev. 2 recommendation.
Display:	One indicator One computer point. One channel recorded
Position:	The design temperature of the Quench Tank is 300°F which is greater than the maximum temperature reached in the tank during a design transient. The tank design pressure is 55 psig, which is greater than the calculated pressure of approximately 50 psig (rupture disc pressure) attained after the most severe transient. The saturation temperature for 50 psig is 297°F. Thus, a range of 50-325°F will adequately measure the expected maximum temperature as well as saturation temperature for the Quench Tank. Duke's present instrumentation will be changed to the range of 50 - 325°F.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

D-15	Variable:	Quench Tank Pressure
	Range:	0 to design pressure
	Category:	3
	Existing Design:	The indicated range of the Quench Tank pressure is from 0 to 60 psig. The tank rupture disc pressure is 50 psig. The tank design pressure is 55 psig.
	Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
	Display:	One indicator One computer point One channel recorded
	Position:	The installed instrumentation is adequate for the intended monitoring function.
	Implementation Schedule:	Not Applicable.

D-18

Variable:	Safety/Relief Valve Position or Main Steam Flow
Range:	Closed-Not Closed
Category:	2
Existing Design:	This variable is not monitored directly.
Compliance:	This variable is not in compliance with RG 1.97 recommendations.
Display:	None
Position:	The positions of the Main Steam Safety Valves (MSSV) are not required to mitigate the consequences of a design basis accident. Direct indication of safety valve position is not provided but indirect indication is provided via control room indication of steam generator pressure. During Duke's Control Room Design Review, a specific Task Analysis Evaluation of MSSV indication was undertaken. This evaluation dealt with steam leak transients with and without MSSV indication. As a result of this evaluation, direct MSSV indication was found not necessary. Also, sound emitted from the valves provides an audible indication to the operators when the valves lift. Duke feels that this is adequate indication for the intended monitoring function.
Implementation Schedule:	Not Applicable.

D-19	Variable:	Main Feedwater Flow
	Range:	0 to 110% Design Flow
	Category:	3
	Existing Design:	Oconee has four main feedwater flow channels, two channels per steam generator feedline. The indicated range for this variable is 0 to $6.0X10^6$lbs/HR which corresponds to 0 to 113% of design flow.
	Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
	Display:	Four channels on the computer Four channels recorded (Selectable, one of two per feedline)
	Position:	The installed instrumentation is adequate for the intended monitoring function.
	Implementation Schedule:	Not Applicable.

D-20

Variable:	Auxiliary Feedwater Flow
Range:	0 to 110% Design Flow
Category:	1 (for B&W Plants)
Existing Design:	Oconee has four QA Condition 1 flow transmitters, two per steam generator monitoring Emergency Feedwater Flow from all EFDW pumps to each steam generator. The indicated range for this variable is 0 to 1200 GPM which corresponds to a range of 0 to 115% design flow. This instrumentation is powered from safety grade emergency power. The flow transmitters are located in a mild environment. Seismic qualification methodology for these transmitters is as described in the Oconee FSAR, Section 3.10. The indicators are located in the control room which is a mild environment.
Compliance:	The instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	Four indicators Four computer points (trend recording on demand)
Position:	The present instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

D-23

Variable:	Heat Removal by the Containment Fan Heat Removal System
Range:	Plant specific
Category:	2
Existing Design:	(See Position, below)
Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	(See Position, below)
Position:	The key variable for monitoring Reactor Building Cooler performance is Reactor Building Pressure instrumentation which is Category 1 (see variable sheet B-13). Backup instrumentation includes Nuclear Safety Related indication of each Reactor Building Cooler Fan motor starter status (high and low speed lights), each Fan motor starter status on the computer, indication of each Fan motor amperage, indication of inlet and outlet cooling water flow to each cooler, and inlet and outlet air temperature indication for each cooler. All of the above indications are provided in the control room. The installed instrumentation is adequate for the intended monitoring functions. For backup indications, the level of environmental qualification provided for the instrumentation is consistent with the performance expectations of the instrumentation and meets the recommendations of Category 3 in Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Implementation Schedule:	Not Applicable.

D-24 Variable: Containment Atmosphere (Reactor Building Air) Temperature

Range: 40°F to 400°F

Category: 2

Existing Design: Thirteen dual element thermocouples are provided to measure Reactor Building air temperature. One element of each T/C provides an input to the plant computer and the second element of each T/C provides an input to a multipoint recorder. The plant computer displays a range of 0 to 390°F, the recorder displays 0 to 300°F. The plant computer and the recorder are powered by highly reliable battery backed busses.

Compliance: The range and the environmental qualification of the instrumentation is not in compliance with the recommendations of RG 1.97, Rev. 2.

Display: Thirteen points recorded Thirteen computer points

*Position: The displayed ranges are adequate for the intended monitoring function. The worst case DBA temperature in the Reactor Building is 286°F. For accidents in which harsh RB environments are a result, pressure and temperature are coupled such that as RB pressure is reduced the temperature is also reduced. Therefore, RB pressure is considered the priority variable with temperature as a Category 3 backup variable. The level of environmental qualification provided for this instrumentation is consistent with its performance expectations and meets the recommendations of Category 3 in Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.

Implementation Schedule: Not Applicable.

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97

D-25 Variable: Containment Sump Water Temperature

*Position: Reactor Building Sump water temperature instrumentation is not currently installed at Oconee. It is not recorded or indicated because it is not required to mitigate the consequences of design basis accident. The minimum available NPSH for the Decay Heat Removal pumps is conservatively calculated with sufficient safety margin such that indication of sump temperature is not required in order to insure adequate NPSH and no automatic or manual actions are initiated based on this temperature.

For containment cooling, Reactor Building pressure is the variable of primary importance (See variable sheet B-13). Backup indication for RB cooling is provided by Containment Atmosphere Temperature (sheet D-24) Heat Removal by the Containment Fan Heat Removal System (sheet 0-23), and Containment Spray Flow (sheet D-22).

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97.

D-26

Variable:	Makeup Flow
Range:	0 to 110% Design Flow
Category:	2
Existing Design:	The existing instrumentation for this variable provides continuous monitoring of reactor coolant makeup flow. The loop range is 0 to 160 gallons per minute. Design flow is 35 GPM. This instrument is pneumatic and is supplied by the normal Station Air System. The instrumentation is located in a mild temperature environment.
Compliance:	The transmitter for this variable is not rated to withstand the anticipated maximum design basis accident radiation dose for the installed location.
Display:	One indicator
*Position:	The installed instrumentation is adequate for the intended monitoring function. For accidents in which harsh environments are a result, the portion of the system containing this instrumentation is not required for the mitigation of these accidents and is automatically bypassed upon an ESF Actuation. Therefore, Makeup Flow is not a key variable for accident monitoring and is considered to be Category 3 instrumentation. The level of environmental qualification provided for the instrumentation in this system is consistent with the performance expectations of the system and meets the recommendations of Category 3 in Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Implementation Schedule:	Not Applicable.

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97.

D-27

Variable:	Letdown Flow
Range:	0 to 110% Design Flow
Category:	2
Existing Design:	The existing instrumentation for this variable provides continuous monitoring of reactor coolant letdown flow. The loop range is 0 to 160 gallons per minute. Design flow is 70 GPM. This instrument loop is powered from a highly reliable battery backed bus. The instrumentation is located in a mild temperature environment.
Compliance:	The transmitter for this variable is not rated to withstand the anticipated maximum design basis accident radiation dose for the installed location.
Display:	One indicator One computer point
*Position:	The installed instrumentation is adequate for the intended monitoring function. For accidents in which harsh environments are a result, the portion of the system containing this instrumentation is not required for the mitigation of these accidents and is automatically isolated upon an ESF Actuation. Therefore, Letdown Flow is not a key variable for accident monitoring and is considered to be Category 3 instrumentation. The level of environmental qualification provided for the instrumentation in this system is consistent with the performance expectations of the system and meets the recommendations of Category 3 in Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Implementation Schedule:	Not Applicable.

*Reflects justifications developed by the B&W Owners Group Task Force on RG 1.97.

D-28

Variable:	Volume Control Tank (Letdown Storage Tank) Level
Range:	Top to Bottom
Category:	2
Existing Design:	The existing instrumentation for this variable provides continuous monitoring of the letdown storage tank level. The loop range is 0 to 100 inches which covers the linear portion of the tank (approximately 16 to 84% of tank volume). This instrument loop is powered from a highly reliable battery backed bus. This instrumentation is located in a mild environment.
Compliance:	The range of the instrumentation is not in full compliance with the RG 1.97, Rev. 2 recommendations.
Display:	One channel (of two selectable) recorded
Position:	Minimum and maximum letdown storage tank levels are maintained within the range of the instrument. Extending the range into the domed portions of this tank would result in nonlinear readings at each extreme of the scale. The installed range is adequate for measuring letdown storage tank level and Duke considers the installed instrumentation adequate for the intended monitoring function. Although Category 2 recommendations are met, this tank is not required to be utilized during an accident. Therefore, a classification of Category 3 for this instrumentation would be appropriate for Oconee.
Implementation Schedule:	Not Applicable.

D-29	Variable:	Component Cooling Water Temperature to ESF System
	Range:	32°F to 200°F
	Category:	2
	Position:	The Oconee system for providing cooling water to ESF components is the Low Pressure Service Water System (LPSW). The inlet temperature of the LPSW by design is based on a maximum temperature of 75°F from near the bottom of Lake Keowee. There is no control over the temperature of the LPSW; therefore, there is no need to indicate the LPSW temperature in the control room since no operator action is taken based on this temperature and, by design, no useful information would be provided to the operator by such instrumentation.

D-30

Variable:	Component Cooling Water Flow to ESF Systems
Range:	0 to 110% Design Flow
Category:	2
Existing Design:	The Oconee system for providing cooling water to ESF components is the Low Pressure Service Water System (LPSW). Primary indication of proper LPSW system and pump operation is line pressure measured in each of two headers. The indicated range is 0 to 160 psig for a system design pressure of 78 psig. These instruments are pneumatic and are supplied by the normal Station Air System. The instruments are located in a mild environment. Additional instruments provide backup indication in the control room of proper system operation. These include LPSW pump motor amperage, valve position indication on valves operated in the control room, inlet and/or outlet cooling water flow for certain ESF coolers, and flow and pressure alarms.
Compliance:	The measured variable is different than the recommendation of RG 1.97, Rev. 2. The power source of the measured variable does not meet Category 2 recommendations. Some of the backup instrumentation does not meet Category 2 recommendations.
Display:	Two indicators
Position:	LPSW header pressure is a valid measurement of system and pump operation and Duke considers the existing indications to meet the intent of RG 1.97, Rev. 2 as clarified in Section 5.5. A power supply (air or electrical) that meets Category 2 recommendations (as clarified in Section 5.5) will be provided for the LPSW header pressure instruments. For backup variables, a design qualification of Category 3 is adequate for the intended monitoring functions and consistent with the performance expectations of the instrumentation.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

D-31	Variable:	High Level Radioactive Liquid Tank Level (RC Bleed Holdup Tank Level)
	Range:	Top to Bottom
	Category:	3
	Existing Design:	The indicated range for this variable is 0 to 180 inches for the RC Bleed Holdup tank. This level indication corresponds to a tank volume of approximately 1% to 99%.
	Compliance:	The range is not in complete compliance with the recommendation of RG 1.97, Rev. 2.
	Display:	One indicator
	Position:	The tap to tap range of the installed instruments is adequate to provide tank level information for all design basis events. Duke considers the installed instrumentation adequate for the intended monitoring function.
	Implementation Schedule:	Not Applicable.

D-32

Variable:	Radioactive Gas Holdup Tank Pressure (Waste Gas Decay Tank Pressure)
Range:	0 to 150% Design Pressure
Category:	3
Existing Design:	Oconee utilizes two tanks per unit for radioactive waste gas storage. The maximum operating pressure for these tanks is approximately 100 psig (per the Oconee FSAR, Section 11.3). The indicated range is 0 to 150 psig for each tank.
Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	Two computer points (one per tank) Two channels recorded (one per tank)
Position:	The installed instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

D-33 Variable: Emergency Ventilation Damper Position

Range: Open-Closed Status

Category: 2

Existing Design: There are three Emergency Ventilation Systems at Oconee. Each system has indication that the required emergency alignment has been achieved in the control room. For the Reactor Building Purge System direct indication of damper position is provided. For the in-containment damper limit switches in this system environmental qualification is described in the Oconee Nuclear Station IEB-79-01B submittal and this instrumentation is powered from safety grade emergency power. For the out-of-containment damper limit switches, environmental qualification documentation may not be available and power is from a highly reliable battery backed bus. For the Penetration Room Ventilation System, positive indication of proper system operation is provided by the Penetration Room Pressure Instrumentation. This instrumentation is pneumatic and is supplied by normal Station Air System. The Unit 1 and 2 instruments are located in mild environments; however, the Unit 3 instrumentation may be in a harsh environment and qualification documentation may not be available. For a description of the instrumentation required to determine proper operation of the Reactor Building Cooling System see variable D-23 (Heat Removal by the Containment Fan Heat Removal System).

Compliance: The Reactor Building Purge System out-of-containment dampers and the Unit 3 Penetration Room pressure-indication instrumentation may not be environmentally qualified for their post-accident environments.

Display: Control switch indicating lights
Analog indicators
Computer points

Position: If no documentation is available to verify the environmental qualification of the instrumentation in question, then this instrumentation will be relocated or replaced with qualified instrumentation.

Implementation Schedule: Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

D-34

Variable:	Status of Standby Power and Other Energy Sources Important to Safety
Range:	Voltages, currents, pressures
Category:	2
Existing Design:	All safety-grade emergency or battery backed control busses have undervoltage alarms in the Control Room with local diagnostic capabilities to enable an expedient assessment of abnormal situations. In addition, the 125 VDC distribution centers have analog indicators of voltage level in the Control Room. All of the Control Room alarms are on highly reliable battery backed busses. All of the sensing relays and alarm electronics are located in a mild environment.
Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	Annunciators Analog indicators Computer digital points
Position:	The installed instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

E-7a

Variable:	Common Plant Vent Radioactive Discharge
Range:	10^{-6} uCi/cc to 10^{4} uCi/cc
Category:	2
Existing Design:	Oconee has a normal range, high range and high-high range channel of unit vent radioactivity instrumentation. These channels are powered from a highly reliable battery backed bus. The indicated range is 0.1 to 10^{7}, R/hr gross gamma for the high-high range monitor, which envelops the upper end of the recommended range. The indicated range is 10 to 10^{6} cpm for both the normal and high range monitors corresponding to 10^{-6} to 1.5×10^{3} uCi/ml Kr-85. This instrumentation is installed in a mild environment.
Compliance:	The high-high range instrumentation has not demonstrated reliable operation and is in the process of being replaced.
Display:	Three indicators Three computer points Three channels recorded
Position:	Duke Power is currently in the process of procuring a suitable replacement for the high-high range monitor.
Implementation Schedule:	The implementation schedule will be supplied under a separate submittal concerning this item.

E-7b

Variable:	Common Plant Vent Flow
Range:	0 to 110% Vent Design Flow
Category:	2
Existing Design:	The installed instrumentation indicates flow in the unit vent stack over the range of 0 to 110,000 SCFM. The design flow for the Unit 1 stack is 110,340 SCFM (112,145 for Unit 2; 127,250 for Unit 3). The primary instrument loop which contains the transmitter, the plant computer and a retransmitter is powered by a highly reliable battery backed bus. The secondary instrument loop contains the retransmitter, indicator and recorder, and is powered by a highly reliable auxiliary bus. The instrumentation is located in a mild environment.
Compliance:	The range of the instrumentation is not in compliance with the RG 1.97, Rev. 2 recommendations.
Display:	One indicator One channel recorded One computer point
Position:	The existing instrumentation will be recalibrated or new instruments will be installed to include the range recommended by RG 1.97, Rev. 2.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

E-8

Variable:	Radiation Monitoring for the Vent from Steam Generator Safety Relief Valves or Atmospheric Dump Valves
Range:	10^{-1} uCi/cc to 10^{3} uCi/cc
Category:	2
Existing Design:	Area radiation monitors are located adjacent to the main steam lines and upstream of the turbine stop valves to detect secondary side radiation. Correlation curves will allow conversion of the monitor readings in mR/hr to uCi/cc. The indicated range is 10^{-2} is 10^{-3} mR/hr corresponding to approximately 10^{-3} to 10^{1} uCi/cc. The instrumentation is powered from highly reliable battery backed control buses. This instrumentation is rated to withstand the environmental conditions that would exist during accidents in which it is intended to operate. A steam line break in the vicinity of this instrumentation may cause the environment to exceed the rated temperature, however, the instrument is not required to remain functional for this event.
Compliance:	The range is not in compliance with the recommendations of RG 1.97, Rev. 2.
Display:	Two indicators Two computer points Trend recording on demand
Position:	New radiation monitors will be installed to cover the range recommended by RG 1.97, Rev. 2. They will be powered by highly reliable battery backed buses. The instrumentation will be rated to withstand environmental conditions for its location, with the exception of a steam line break in the vicinity of the detector.
Implementation Schedule:	Implementation of changes proposed as part of the Oconee RG 1.97, Rev. 2 Review, will be integrated with changes identified in HED solutions as part of the Control Room Design Review. RG 1.97, Rev. 2 related changes will be completed prior to or in conjunction with the scheduled final completion of HED solutions as described in Appendix D to Section 3.4.

E-10
E-12
E-13
E-14

Variable:	Plant Airborne and Area Radiation (sampling with onsite analysis, portable instrumentation)
Range:	Various ranges listed in RG 1.97, Rev. 2
Category:	3
Existing Design:	Equipment and facilities exist at Oconee for making the measurements and analyses recommended by RG 1.97, Rev. 2. Information concerning these capabilities is in the Oconee FSAR, Section 12.4.
Compliance:	This instrumentation is in compliance with Duke's interpretation of RG 1.97, Rev. 2 as clarified in Section 5.5.
Display:	Not Applicable.
Position:	The existing instrumentation is adequate for the intended monitoring functions.
Implementation Schedule:	Not Applicable.

E-11 Variable: Radiation Exposure Meters

This variable is not required based on information given in Supplement 1 to NUREG 0737 Section 6.1-b and the Errata sheet to RG 1.97, Rev. 2 dated May, 1981.

E-15

Variable:	Wind Direction
Range:	0 to 360° (±5° accuracy with a deflection of 15°). Starting speed 0.45 mps (1.0 mph). Damping ratio between 0.4 and 0.6, distance constant ≤ 2 meters
Category:	3
Existing Design:	Oconee has two channels of wind direction instrumentation. The indicated range is 0 to 540°. The starting speed 0.7 mph and the damping ratio is 0.4 both at 10°. Loop accuracy is approximately ±6°. The distance constant is 3.7 ft. (1.1 meter).
Compliance:	The accuracy does not meet the RG 1.97, Rev. 2 recommendations.
Display:	Two channels recorded Two channels on the computer
Position:	The recommended accuracy of ±5° over a range of 0 to 360° equates to ±1.39% full scale. The Oconee wind direction loop accuracy is approximately ±1.11% full scale which exceeds the equivalent recommended accuracy. Duke has determined the existing instrumentation is adequate for the intended monitoring function.
Implementation Schedule:	Not Applicable.

E-16

Variable:	Wind Speed
Range:	0 - 67 mph (accuracy of ±0.5 mph under 25 mph, starting threshold under 1.0 mph)
Category:	3
Existing Design:	Oconee has two channels of wind speed instrumentation. The indicated range is 0 - 60 mph. The loop accuracy is 0.5 mph or better under 25 mph and the starting threshold is 0.63 mph.
Compliance:	Range is not in compliance with RG 1.97, Rev. 2 recommendations.
Display:	Two channels on the computer Two channels recorded
Position:	The range of the installed instruments are adequate for Oconee site meteorological conditions. Also note, present range exceeds the recommendation of RG 1.97, Rev. 3.
Implementation Schedule:	Not Applicable.

E-17

Variable:	Atmospheric Stability
Range:	-5° to 10° C (±0.15°C accuracy) per 50 meter interval
Category:	3
Existing Design:	The indicated range for atmospheric stability is -4° to 8° C for a 44.7 meter interval. Loop accuracy is at least ±0.15° C.
Compliance:	Range is not in compliance with RG 1.97, Rev. 2 recommendations.
Display:	One computer point One channel recorded
Position:	The range of the installed instrument is adequate for Oconee site meteorological conditions.
Implementation Schedule:	Not Applicable.