

# LGS UFSAR

## CHAPTER 7 - INSTRUMENTATION AND CONTROL SYSTEMS

### TABLE OF CONTENTS

7.1	<u>INTRODUCTION</u>
7.1.1	Identification of Safety-Related Systems
7.1.1.1	General
7.1.1.2	Identification of Individual Systems
7.1.1.3	Classification
7.1.1.3.1	Safety-Related Systems
7.1.1.3.2	Power Generation Systems
7.1.1.3.3	General Functional Requirements of Design Basis
7.1.1.3.4	Specific Regulatory Requirements
7.1.2	Identification of Safety Criteria
7.1.2.1	General
7.1.2.1.1	Reactor Protection System - Instrumentation and Controls
7.1.2.1.2	Primary Containment and Reactor Vessel Isolation Control System - Instrumentation and Controls
7.1.2.1.3	Emergency Core Cooling System - Instrumentation and Controls
7.1.2.1.4	Neutron Monitoring System - Instrumentation and Controls
7.1.2.1.5	Refueling Interlocks - Instrumentation and Controls
7.1.2.1.6	Reactor Manual Control System - Instrumentation and Controls
7.1.2.1.7	Reactor Vessel Instrumentation
7.1.2.1.8	Recirculation Flow Control System - Instrumentation and Controls
7.1.2.1.9	Feedwater Control System - Instrumentation and Controls
7.1.2.1.10	Pressure Regulator and Turbine-Generator System - Instrumentation and Controls
7.1.2.1.11	Process Radiation Monitoring System - Instrumentation and Controls
7.1.2.1.12	Area Radiation Monitoring System
7.1.2.1.13	Deleted
7.1.2.1.14	Habitability and Control Room Isolation System - Instrumentation and Controls
7.1.2.1.15	Service Water Systems - Instrumentation and Controls
7.1.2.1.16	Containment Atmospheric Control System - Instrumentation and Controls
7.1.2.1.17	Reactor Core Isolation Cooling System - Instrumentation and Controls
7.1.2.1.18	Standby Liquid Control System - Instrumentation and Controls
7.1.2.1.19	Radwaste Systems - Instrumentation and Controls
7.1.2.1.20	Reactor Water Cleanup System - Instrumentation and Controls
7.1.2.1.21	Class 1E Power Systems
7.1.2.1.22	Leak Detection Systems - Instrumentation and Controls
7.1.2.1.23	Reactor Shutdown Cooling Mode of the RHR System - Instrumentation and Controls
7.1.2.1.24	Fuel Pool Cooling and Cleanup System - Instrumentation and Controls
7.1.2.1.25	Reactor Enclosure Recirculation System - Instrumentation and Controls
7.1.2.1.26	Standby Gas Treatment System - Instrumentation and Controls
7.1.2.1.27	Deleted
7.1.2.1.28	Safety-Related Display Instrumentation
7.1.2.1.29	Containment Instrument Gas System - Instrumentation and Controls

## LGS UFSAR

- 7.1.2.1.30 Containment Spray Mode of the RHR System - Instrumentation and Controls
- 7.1.2.1.31 Remote Shutdown System - Instrumentation and Controls
- 7.1.2.1.32 Suppression Pool Cooling Mode of the RHR System - Instrumentation and Controls
- 7.1.2.1.33 Safety-Related Equipment Area Cooling Ventilation Systems
- 7.1.2.1.34 Drywell Unit Coolers - Instrumentation and Controls
- 7.1.2.1.35 Control Enclosure Chilled Water System - Instrumentation and Controls
- 7.1.2.1.36 High Pressure/Low Pressure System Interlocks
- 7.1.2.1.37 Safety/Relief Valve Position Indication System - Instrumentation and Controls
- 7.1.2.1.38 Fire Protection and Suppression System
- 7.1.2.1.39 Reactor Enclosure Isolation System
- 7.1.2.1.40 Nonsafety-Related Equipment Area Cooling Ventilation Systems
- 7.1.2.1.41 Safeguard Piping Fill System
- 7.1.2.1.42 Refueling Area Isolation System
- 7.1.2.1.43 Redundant Reactivity Control System
- 7.1.2.1.44 Rod Worth Minimizer (Unit 2)
- 7.1.2.1.45 Plant Monitoring System (Unit 2)
- 7.1.2.1.46 Emergency Response Facility Data System (Unit 1)
- 7.1.2.2 Independence of Redundant Safety-Related Systems
  - 7.1.2.2.1 Introduction
  - 7.1.2.2.2 Mechanical Systems Separation Criteria
  - 7.1.2.2.3 Electrical Systems Separation Criteria
- 7.1.2.3 Physical Identification of Safety-Related Equipment
- 7.1.2.4 Instrument Errors
- 7.1.2.5 Conformance to Regulatory Guides
  - 7.1.2.5.1 Regulatory Guide 1.6 (March 1971) - Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems (Safety Guide 6)
  - 7.1.2.5.2 Regulatory Guide 1.7 (November 1978) - Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident
  - 7.1.2.5.3 Regulatory Guide 1.9 (March 1971) - Selection of Diesel Generator Set Capacity for Standby Power Supplies (Safety Guide 9)
  - 7.1.2.5.4 Regulatory Guide 1.11 (March 1971) - Instrument Lines Penetrating Primary Reactor Containment (Safety Guide 11)
  - 7.1.2.5.5a Regulatory Guide 1.21 (June 1974) - Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants
  - 7.1.2.5.5b Regulatory Guide 1.22 (February 1972) - Periodic Testing of Protection System Actuation Functions (Safety Guide 22)
  - 7.1.2.5.6 Regulatory Guide 1.29 (September 1978) - Seismic Design Classification
  - 7.1.2.5.7 Regulatory Guide 1.30 (August 1972) - Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment (Safety Guide 30)
  - 7.1.2.5.8 Regulatory Guide 1.32 (February 1977) - Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants
  - 7.1.2.5.9 Regulatory Guide 1.40 (March 1973) - Qualification Tests of Continuous-Duty Motors Installed Inside the Containment of Water-Cooled Nuclear Power Plants
  - 7.1.2.5.10 Regulatory Guide 1.45 (May 1973) - Reactor Coolant Pressure Boundary Leakage Detection Systems

## LGS UFSAR

- 7.1.2.5.11 Regulatory Guide 1.47 (May 1973) - Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems
- 7.1.2.5.12 Regulatory Guide 1.53 (June 1973) - Application of the Single Failure Criterion to Nuclear Power Plant Protection Systems
- 7.1.2.5.13 Regulatory Guide 1.56 (July 1978) - Maintenance of Water Purity in Boiling Water Reactors
- 7.1.2.5.14 Regulatory Guide 1.62 (October 1973) - Manual Initiation of Protective Actions
- 7.1.2.5.15 Regulatory Guide 1.63 (July 1978) - Electric Penetration Assemblies in Containment Structures for Light-Water-Cooled Nuclear Power Plants
- 7.1.2.5.16 Regulatory Guide 1.68 (August 1978) - Preoperational and Initial Startup Test Programs for Water-Cooled Power Reactors
- 7.1.2.5.17 Regulatory Guide 1.70 (November 1978) - Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants
- 7.1.2.5.18 Regulatory Guide 1.73 (January 1974) - Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants
- 7.1.2.5.19 Regulatory Guide 1.75 (September 1978) - Physical Independence of Electric Systems
- 7.1.2.5.20 Regulatory Guide 1.80 (June 1974) - Preoperational Testing of Instrument Air Systems
- 7.1.2.5.21 Regulatory Guide 1.89 (November 1974) - Qualification of Class 1E Equipment for Nuclear Power Plants
- 7.1.2.5.22 Regulatory Guide 1.96 (May 1975) - Design of Main Steam Isolation Valve Leakage Control Systems for Boiling Water Reactor Nuclear Power Plants
- 7.1.2.5.23 Regulatory Guide 1.97 (December 1980) - Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident
- 7.1.2.5.24 Regulatory Guide 1.100 (August 1977) - Seismic Qualification of Electric Equipment for Nuclear Power Plants
- 7.1.2.5.25 Regulatory Guide 1.105 (November 1976) - Instrument Setpoints
- 7.1.2.5.26 Regulatory Guide 1.118 (June 1978) - Periodic Testing of Electric Power and Protection Systems
- 7.1.2.5.27 Regulatory Guide 1.139 (May 1978) - Guidance for Residual Heat Removal
- 7.1.2.6 Conformance to 10CFR50, Appendix A, General Design Criteria
- 7.1.2.6.1 GDC 1 - Quality Standards and Records
- 7.1.2.6.2 GDC 2 - Design Bases for Protection Against Natural Phenomena
- 7.1.2.6.3 GDC 3 - Fire Protection
- 7.1.2.6.4 GDC 4 - Environmental and Dynamic Effects Design Bases
- 7.1.2.6.5 GDC 5 - Sharing of Structures, Systems, and Components
- 7.1.2.6.6 GDC 10 - Reactor Design
- 7.1.2.6.7 GDC 12 - Suppression of Reactor Power Oscillations
- 7.1.2.6.8 GDC 13 - Instrumentation and Control
- 7.1.2.6.9 GDC 15 - Reactor Coolant System Design
- 7.1.2.6.10 GDC 19 - Control Room
- 7.1.2.6.11 GDC 20 - Protection System Functions
- 7.1.2.6.12 GDC 21 - Protection System Reliability and Testability
- 7.1.2.6.13 GDC 22 - Protection System Independence
- 7.1.2.6.14 GDC 23 - Protection System Failure Modes
- 7.1.2.6.15 GDC 24 - Separation of Protection and Control Systems
- 7.1.2.6.16 GDC 25 - Protection System Requirements for Reactivity Control Malfunctions
- 7.1.2.6.17 GDC 26 - Reactivity Control System Redundancy and Capability

## LGS UFSAR

- 7.1.2.6.18 GDC 27 - Combined Reactivity Control Systems Capability
- 7.1.2.6.19 GDC 28 - Reactivity Limits
- 7.1.2.6.20 GDC 29 - Protection Against Anticipated Operational Occurrences
- 7.1.2.6.21 GDC 30 - Quality of Reactor Coolant Pressure Boundary
- 7.1.2.6.22 GDC 33 - Reactor Coolant Makeup
- 7.1.2.6.23 GDC 34 - Residual Heat Removal
- 7.1.2.6.24 GDC 35 - Emergency Core Cooling
- 7.1.2.6.25 GDC 37 - Testing of Emergency Core Cooling System
- 7.1.2.6.26 GDC 38 - Containment Heat Removal
- 7.1.2.6.27 GDC 40 - Testing of Containment Heat Removal System
- 7.1.2.6.28 GDC 56 - Primary Containment Isolation
- 7.1.2.6.29 GDC 57 - Closed System Isolation Valves
- 7.1.2.6.30 GDC 60 - Control of Releases of Radioactive Materials to the Environment
- 7.1.2.6.31 GDC 61 - Fuel Storage and Handling and Radioactivity Control
- 7.1.2.6.32 GDC 63 - Monitoring Fuel and Waste Storage
- 7.1.2.6.33 GDC 64 - Monitoring Radioactivity Releases
- 7.1.2.7 Conformance to Industry Codes and Standards
  - 7.1.2.7.1 IEEE 279 (1971) - Criteria for Protection Systems for Nuclear Power Generating Stations
  - 7.1.2.7.2 IEEE 308 (1971 and 1974) - Criteria for Class 1E Electrical Systems for Nuclear Power Generating Stations
  - 7.1.2.7.3 IEEE 317 (1972) - Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations
  - 7.1.2.7.4 IEEE 323 (1971) - IEEE Trial Use Standard: General Guide for Qualifying Class 1 Electric Equipment for Nuclear Power Generating Stations
  - 7.1.2.7.5 IEEE 336 (1971) - Installation, Inspection, and Testing Requirements for Instrumentation and Electric Equipment During the Construction of Nuclear Power Generating Stations
  - 7.1.2.7.6 IEEE 338 (1971, 1975, and 1977) - Criteria for the Periodic Testing of Nuclear Power Generating Station Protection Systems
  - 7.1.2.7.7 IEEE 344 (1971 or 1975) - Guide for Seismic Qualification of Class 1 Electric Equipment for Nuclear Power Generating Stations
  - 7.1.2.7.8 IEEE 379 (1972 or 1977) - Guide for the Application of the Single Failure Criterion to Nuclear Power Generating Station Protection Systems
  - 7.1.2.7.9 IEEE 382 (1972) - Trial Use Guide for Type Test of Class 1 Electric Valve Operators for Nuclear Power Generating Stations
  - 7.1.2.7.10 IEEE 383 (1974) - Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations
  - 7.1.2.7.11 IEEE 384 (1974 or 1977) - Criteria for Separation of Class 1E Equipment and Circuits
- 7.1.2.8 Conformance to Branch Technical Positions
  - 7.1.2.8.1 BTP ICSB 3
  - 7.1.2.8.2 BTP ICSB 21
  - 7.1.2.8.3 BTP ICSB 22
  - 7.1.2.8.4 BTP ICSB 26
- 7.1.2.9 Technical Design Bases
- 7.1.2.10 Safety System Settings
- 7.1.2.11 Operating Experience Assessment
  - 7.1.2.11.1 Bulletin 80-06, Engineered Safety Feature Reset Controls
  - 7.1.2.11.2 Information Notice 79-22, Qualification of Control Systems

## LGS UFSAR

- 7.1.2.11.3 Bulletin 79-27, Loss of Non-Class 1E Instrumentation and Control Power Systems Bus During Operation
- 7.1.3 Protection System Inservice Testability
- 7.1.4 References
- 7.2 REACTOR TRIP SYSTEM (REACTOR PROTECTION SYSTEM) - INSTRUMENTATION AND CONTROLS
  - 7.2.1 Description
    - 7.2.1.1 System Description
      - 7.2.1.1.1 RPS Identification
      - 7.2.1.1.2 RPS Classification
      - 7.2.1.1.3 RPS Power Sources
      - 7.2.1.1.4 RPS Equipment Design
      - 7.2.1.1.5 RPS Environmental Considerations
      - 7.2.1.1.6 RPS Operational Considerations
      - 7.2.1.1.7 RPS Containment Electrical Penetration Assignment
      - 7.2.1.1.8 RPS Control Room Area
      - 7.2.1.1.9 Test Methods that Enhance RPS Reliability
      - 7.2.1.1.10 Interlock Circuits to Inhibit Rod Motion as Well as Vary the Protection Function
      - 7.2.1.1.11 RPS Support Cooling Systems
    - 7.2.1.2 RPS Design Bases
      - 7.2.1.2.1 Conditions
      - 7.2.1.2.2 Variables
      - 7.2.1.2.3 Sensors
      - 7.2.1.2.4 Operational Limits
      - 7.2.1.2.5 Margin Between Operational Limits
      - 7.2.1.2.6 Levels Requiring Protective Action
      - 7.2.1.2.7 Ranges of Energy Supply and Environmental Conditions
      - 7.2.1.2.8 Unusual Events
      - 7.2.1.2.9 Performance Requirements
    - 7.2.1.3 RPS Final System Drawings
  - 7.2.2 Analysis
    - 7.2.2.1 Reactor Protection System - Instrumentation and Controls
      - 7.2.2.1.1 RPS General Functional Requirements Conformance
      - 7.2.2.1.2 RPS Specific Regulatory Requirements Conformance
      - 7.2.2.1.3 RPS Additional Design Considerations Analyses
  - 7.2.3 References
- 7.3 ENGINEERED SAFETY FEATURE SYSTEMS
  - 7.3.1 Description
    - 7.3.1.1 System Description
      - 7.3.1.1.1 Emergency Core Cooling Systems - Instrumentation and Controls
      - 7.3.1.1.2 Primary Containment and Reactor Vessel Isolation Control System - Instrumentation and Controls

## LGS UFSAR

- 7.3.1.1.3 Deleted
- 7.3.1.1.4 RHR Containment Spray Mode - Instrumentation and Controls
- 7.3.1.1.5 RHR Suppression Pool Cooling Mode - Instrumentation and Controls
- 7.3.1.1.6 Containment Atmospheric Control System - Instrumentation and Controls
- 7.3.1.1.7 Standby Gas Treatment System - Instrumentation and Controls
- 7.3.1.1.8 Reactor Enclosure Recirculation System - Instrumentation and Controls
- 7.3.1.1.9 Reactor Enclosure Isolation System - Instrumentation and Controls
- 7.3.1.1.10 Habitability and Control Room Isolation System - Instrumentation and Controls
- 7.3.1.1.11 Emergency Service Water System - Instrumentation and Controls
- 7.3.1.1.12 RHR Service Water System - Instrumentation and Controls
- 7.3.1.1.13 Control Enclosure Chilled Water System - Instrumentation and Controls
- 7.3.1.1.14 Class 1E Power System
- 7.3.1.1.15 Safety-Related Equipment Area Cooling Ventilation Systems - Instrumentation and Controls
- 7.3.1.1.16 Drywell Unit Coolers - Instrumentation and Controls
- 7.3.1.1.17 Refueling Area Isolation System - Instrumentation and Controls
- 7.3.1.2 IEEE 279 (1971) Design Basis Information
  - 7.3.1.2.1 IEEE 279 Design Basis Information - Conditions
  - 7.3.1.2.2 IEEE 279 Design Basis Information - Variables
  - 7.3.1.2.3 IEEE 279 Design Basis Information - Number and Location of Sensors with Spatial Dependence Only
  - 7.3.1.2.4 IEEE 279 Design Basis Information - Operational Limits
  - 7.3.1.2.5 IEEE 279 Design Basis Information - Margin Between Operational Limits
  - 7.3.1.2.6 IEEE 279 Design Basis Information - Levels Requiring Protective Action
  - 7.3.1.2.7 IEEE 279 Design Basis Information - Range of Energy Supply and Environmental Conditions of Safety Systems
  - 7.3.1.2.8 IEEE 279 Design Basis Information - Malfunctions, Accidents, and Other Unusual Events that Could Cause Damage to the Safety System
  - 7.3.1.2.9 IEEE 279 Design Basis Information - Minimum Performance Requirements
- 7.3.1.3 Final System Drawings
- 7.3.2 Analysis
  - 7.3.2.1 Emergency Core Cooling Systems - Instrumentation and Controls
    - 7.3.2.1.1 ECCS General Functional Requirements Conformance
    - 7.3.2.1.2 ECCS Specific Regulatory Requirements Conformance
    - 7.3.2.1.3 ECCS Additional Design Considerations Analyses
  - 7.3.2.2 Primary Containment and Reactor Vessel Isolation Control System - Instrumentation and Controls
    - 7.3.2.2.1 PCRVICS General Functional Requirements Conformance
    - 7.3.2.2.2 PCRVICS Specific Regulatory Requirements Conformance
    - 7.3.2.2.3 PCRVICS Additional Design Considerations Analyses
  - 7.3.2.3 Deleted
  - 7.3.2.3.3 Deleted
  - 7.3.2.4 RHR - Containment Spray Mode - Instrumentation and Controls
    - 7.3.2.4.1 RHR-CSM General Functional Requirements Conformance
    - 7.3.2.4.2 RHR-CSM Specific Regulatory Requirements Conformance
    - 7.3.2.4.3 RHR-CSM Additional Design Considerations Analyses
  - 7.3.2.5 RHR - Suppression Pool Cooling Mode - Instrumentation and Controls
    - 7.3.2.5.1 RHR-SPCM General Functional Requirements Conformance
    - 7.3.2.5.2 RHR-SPCM Specific Regulatory Requirements Conformance
    - 7.3.2.5.3 RHR-SPCM Additional Design Considerations Analyses

## LGS UFSAR

- 7.3.2.6 Containment Atmospheric Control System - Instrumentation and Controls
  - 7.3.2.6.1 CAC Primary Containment Vacuum Relief System -Instrumentation and Controls
  - 7.3.2.6.2 CAC Combustible Gas Control System - Instrumentation and Controls
  - 7.3.2.6.3 CAC Additional Design Considerations Analyses
- 7.3.2.7 Standby Gas Treatment System - Instrumentation and Controls
  - 7.3.2.7.1 SGTS General Functional Requirements Conformance
  - 7.3.2.7.2 SGTS Specific Regulatory Requirements Conformance
- 7.3.2.8 Reactor Enclosure Recirculation System - Instrumentation and Controls
  - 7.3.2.8.1 RERS General Functional Requirements Conformance
  - 7.3.2.8.2 RERS Specific Regulatory Requirements Conformance
- 7.3.2.9 Reactor Enclosure Isolation System - Instrumentation and Controls
  - 7.3.2.9.1 REIS General Functional Requirements Conformance
  - 7.3.2.9.2 REIS Specific Regulatory Requirements Conformance
- 7.3.2.10 Habitability and Control Room Isolation System - Instrumentation and Controls
  - 7.3.2.10.1 HCRIS General Functional Requirements Conformance
  - 7.3.2.10.2 HCRIS Specific Regulatory Requirements Conformance
- 7.3.2.11 Emergency Service Water System - Instrumentation and Controls
  - 7.3.2.11.1 ESW General Functional Requirements Conformance
  - 7.3.2.11.2 ESW Specific Regulatory Requirements Conformance
- 7.3.2.12 RHR Service Water System - Instrumentation and Controls
  - 7.3.2.12.1 RHRSW General Functional Requirements Conformance
  - 7.3.2.12.2 RHRSW Specific Regulatory Requirements Conformance
  - 7.3.2.12.3 RHRSW Additional Design Considerations Analyses
- 7.3.2.13 Control Enclosure Chilled Water System - Instrumentation and Controls
  - 7.3.2.13.1 CECWS General Functional Requirements Conformance
  - 7.3.2.13.2 CECWS Specific Regulatory Requirements Conformance
  - 7.3.2.13.3 CECWS Additional Design Considerations Analyses
- 7.3.2.14 Class 1E Power Systems
- 7.3.2.15 Safety-Related Equipment Area Cooling Ventilation Systems
  - 7.3.2.15.1 SGTS Filter Room and Access Area Unit Coolers - Instrumentation and Controls
  - 7.3.2.15.2 Diesel Generating Enclosure Ventilation System - Instrumentation and Controls
  - 7.3.2.15.3 Spray Pond Pump Structure Ventilation System -Instrumentation and Controls
  - 7.3.2.15.4 Emergency Switchgear and Battery Rooms Cooling System - Instrumentation and Controls
  - 7.3.2.15.5 Emergency Core Cooling Systems Pump Compartment Unit Coolers - Instrumentation and Controls
  - 7.3.2.15.6 Auxiliary Equipment Room Ventilation System - Instrumentation and Controls
  - 7.3.2.15.7 Safety-Related Equipment Area Cooling Ventilation Systems Additional Design Considerations Analyses
- 7.3.2.16 Drywell Unit Coolers - Instrumentation and Controls
  - 7.3.2.16.1 DUC General Functional Requirements Conformance
  - 7.3.2.16.2 DUC Specific Regulatory Requirements Conformance
  - 7.3.2.16.3 DUC Additional Design Considerations Analyses
- 7.3.2.17 Refueling Area Isolation System - Instrumentation and Controls
  - 7.3.2.17.1 RAIS General Functional Requirements Conformance
  - 7.3.2.17.2 RAIS Specific Regulatory Requirements Conformance

## 7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN

- 7.4.1 Description
  - 7.4.1.1 Reactor Core Isolation Cooling System - Instrumentation and Controls

## LGS UFSAR

- 7.4.1.1.1 RCIC System Identification
- 7.4.1.1.2 RCIC Power Sources
- 7.4.1.1.3 RCIC Equipment Design
- 7.4.1.1.4 RCIC Environmental Considerations
- 7.4.1.1.5 RCIC Operational Considerations
- 7.4.1.1.6 RCIC - IEEE 279 - Design Basis
- 7.4.1.2 Standby Liquid Control System - Instrumentation and Controls
  - 7.4.1.2.1 SLCS System Identification
  - 7.4.1.2.2 SLCS Power Sources
  - 7.4.1.2.3 SLCS Equipment Design
  - 7.4.1.2.4 SLCS Environmental Considerations
  - 7.4.1.2.5 SLCS Operational Considerations
  - 7.4.1.2.6 SLCS - IEEE 279 - Design Basis
- 7.4.1.3 Reactor Shutdown Cooling Mode of the RHR System - Instrumentation and Controls
  - 7.4.1.3.1 RHR-SCM System Identification
  - 7.4.1.3.2 RHR-SCM Power Sources
  - 7.4.1.3.3 RHR-SCM Equipment Design
  - 7.4.1.3.4 RHR-SCM Environmental Considerations
  - 7.4.1.3.5 RHR-SCM Operational Considerations
  - 7.4.1.3.6 RHR-SCM - IEEE 279 - Design Basis
- 7.4.1.4 Remote Shutdown System
  - 7.4.1.4.1 RSS Identification
  - 7.4.1.4.2 RSS Description
  - 7.4.1.4.3 RSS Procedure
  - 7.4.1.4.4 RSS Controls and Instrumentation - Equipment, Panels, and Displays
  - 7.4.1.4.5 RSS - IEEE 279 - Design Basis
- 7.4.1.5 Emergency Service Water System - Instrumentation and Controls
- 7.4.1.6 Residual Heat Removal Service Water System - Instrumentation and Controls
- 7.4.1.7 Class 1E Power Systems
- 7.4.1.8 Shutdown Ventilation Systems
  - 7.4.1.8.1 RCIC System Pump Compartment Unit Coolers - Instrumentation and Controls
  - 7.4.1.8.2 RHR System Pump Compartment Unit Coolers
  - 7.4.1.8.3 Remote Shutdown System Ventilation System
- 7.4.2 Analysis
  - 7.4.2.1 Reactor Core Isolation Cooling System - Instrumentation and Controls
    - 7.4.2.1.1 RCIC General Functional Requirements Conformance
    - 7.4.2.1.2 RCIC Specific Regulatory Requirements Conformance
  - 7.4.2.2 Standby Liquid Control System - Instrumentation and Controls
    - 7.4.2.2.1 SLCS General Functional Requirements Conformance
    - 7.4.2.2.2 SLCS Specific Regulatory Requirements Conformance
  - 7.4.2.3 Reactor Shutdown Cooling Mode of the RHR System - Instrumentation and Controls
    - 7.4.2.3.1 RHR-SCM General Functional Requirements Conformance
    - 7.4.2.3.2 RHR-SCM Specific Regulatory Requirements Conformance
  - 7.4.2.4 Remote Shutdown System - Instrumentation and Controls
    - 7.4.2.4.1 RSS General Functional Requirements Conformance
    - 7.4.2.4.2 RSS Specific Regulatory Requirements Conformance
  - 7.4.2.5 Emergency Service Water System - Instrumentation and Controls

## LGS UFSAR

- 7.4.2.6 Residual Heat Removal Service Water System - Instrumentation and Controls
- 7.4.2.7 Class 1E Power Systems
- 7.4.2.8 Shutdown Ventilation Systems
- 7.4.2.8.1 RCIC System Pump Compartment Unit Coolers - Instrumentation and Controls
- 7.4.2.8.2 RHR System Pump Compartment Unit Coolers
- 7.4.2.8.3 Remote Shutdown System Ventilation System
- 7.4.2.9 Additional Design Consideration Analyses
- 7.4.2.9.1 Loss of Plant Instrument Air
- 7.4.2.9.2 Loss of Cooling Water to Vital Equipment
- 7.4.2.9.3 Plant Load Rejection
- 7.4.2.9.4 Turbine Trip

### 7.5 INFORMATION SYSTEMS IMPORTANT TO SAFETY

- 7.5.1 Description
  - 7.5.1.1 General
  - 7.5.1.2 Normal Operation
  - 7.5.1.3 Transient Occurrences
  - 7.5.1.4 Accident Conditions
    - 7.5.1.4.1 Initial Accident Event
    - 7.5.1.4.2 Postaccident Monitoring
    - 7.5.1.4.3 Additional Instrumentation for Regulatory Guide 1.97 Variables
- 7.5.2 Analysis
  - 7.5.2.1 General
  - 7.5.2.2 Normal Operation
  - 7.5.2.3 Transient Occurrences
  - 7.5.2.4 Accident Conditions
    - 7.5.2.4.1 Initial Accident Event
    - 7.5.2.4.2 Postaccident Monitoring
    - 7.5.2.4.3 Safe Shutdown Displays
  - 7.5.2.5 General Functional Requirements Conformance
    - 7.5.2.5.1 Specific Regulatory Requirements Conformance

### 7.6 ALL OTHER INSTRUMENTATION SYSTEMS REQUIRED FOR SAFETY

- 7.6.1 Description
  - 7.6.1.1 Process Radiation Monitoring Systems - Instrumentation and Controls
    - 7.6.1.1.1 Main Steam Line Radiation Monitoring System - Instrumentation and Controls
    - 7.6.1.1.2 Reactor Enclosure Ventilation Exhaust Radiation Monitoring System - Instrumentation and Controls
    - 7.6.1.1.3 Refueling Area Ventilation Exhaust Radiation Monitoring System - Instrumentation and Controls
    - 7.6.1.1.4 Control Room Ventilation Radiation Monitoring System - Instrumentation and Controls
    - 7.6.1.1.5 Control Room Emergency Fresh Air Radiation Monitoring System - Instrumentation and Controls
    - 7.6.1.1.6 Primary Containment Post-LOCA Radiation Monitoring System - Instrumentation and Controls

## LGS UFSAR

- 7.6.1.1.7 Residual Heat Removal Service Water Radiation Monitoring System - Instrumentation and Controls
- 7.6.1.1.8 North Stack Effluent Radiation Monitoring System - Instrumentation and Controls
- 7.6.1.2 High Pressure/Low Pressure Systems Interlocks - Instrumentation and Controls
  - 7.6.1.2.1 HPLPSI Function Identification
  - 7.6.1.2.2 HPLPSI Power Sources
  - 7.6.1.2.3 HPLPSI Equipment Design
  - 7.6.1.2.4 HPLPSI Environmental Considerations
  - 7.6.1.2.5 HPLPSI Operational Considerations
- 7.6.1.3 Leak Detection System - Instrumentation and Controls
  - 7.6.1.3.1 LDS Identification
  - 7.6.1.3.2 LDS Power Sources
  - 7.6.1.3.3 LDS Equipment Design
- 7.6.1.4 Neutron Monitoring System - Instrumentation and Controls
  - 7.6.1.4.1 NMS Identification
  - 7.6.1.4.2 NMS Power Sources
  - 7.6.1.4.3 Intermediate Range Monitor System
  - 7.6.1.4.4 Local Power Range Monitor System
  - 7.6.1.4.5 Average Power Range Monitor System
- 7.6.1.5 Safety/Relief Valve Positions Indication System - Instrumentation and Controls
  - 7.6.1.5.1 SRVPI System Identification
  - 7.6.1.5.2 SRVPI Power Supplies
  - 7.6.1.5.3 SRVPI Initiating Circuits
  - 7.6.1.5.4 SRVPI Logic and Sequencing
  - 7.6.1.5.5 SRVPI Bypasses and Interlocks
  - 7.6.1.5.6 SRVPI Redundancy and Diversity
  - 7.6.1.5.7 SRVPI Testability
  - 7.6.1.5.8 SRVPI Environmental Considerations
  - 7.6.1.5.9 SRVPI Operational Considerations
- 7.6.1.6 Containment Instrument Gas System - Automatic Depressurization System Control - Instrumentation and Controls
  - 7.6.1.6.1 CIGS-ADS Description
  - 7.6.1.6.2 CIGS-ADS Initiating Circuits
  - 7.6.1.6.3 CIGS-ADS Logic
  - 7.6.1.6.4 CIGS-ADS Bypasses
  - 7.6.1.6.5 CIGS-ADS Interlocks
  - 7.6.1.6.6 CIGS-ADS Redundancy and Diversity
  - 7.6.1.6.7 CIGS-ADS Actuated Devices
- 7.6.1.7 Safeguard Piping Fill System - Instrumentation and Controls
  - 7.6.1.7.1 SPFS Description
  - 7.6.1.7.2 SPFS Initiating Circuits
  - 7.6.1.7.3 SPFS Logic
  - 7.6.1.7.4 SPFS Bypasses and Interlocks
  - 7.6.1.7.5 SPFS Redundancy and Diversity
  - 7.6.1.7.6 SPFS Actuated Devices
- 7.6.1.8 Redundant Reactivity Control System - Instrumentation and Controls
  - 7.6.1.8.1 RRCS System Identification
  - 7.6.1.8.2 RRCS Power Sources
  - 7.6.1.8.3 RRCS Equipment Design
- 7.6.2 Analysis

## LGS UFSAR

- 7.6.2.1 Process Radiation Monitoring Systems - Instrumentation and Controls
  - 7.6.2.1.1 Main Steam Line Radiation Monitoring System
  - 7.6.2.1.2 Reactor Enclosure Ventilation Exhaust Radiation Monitoring System
  - 7.6.2.1.3 Refueling Area Ventilation Exhaust Radiation Monitoring System
  - 7.6.2.1.4 Control Room Ventilation Radiation Monitoring System
  - 7.6.2.1.5 Control Room Emergency Fresh Air Radiation Monitoring System
  - 7.6.2.1.6 Primary Containment Post-LOCA Radiation Monitoring System
  - 7.6.2.1.7 RHR Service Water Radiation Monitoring System
  - 7.6.2.1.8 North Stack Effluent Radiation Monitoring System
- 7.6.2.2 High Pressure/Low Pressure Systems Interlocks - Instrumentation and Controls
  - 7.6.2.2.1 HPLPSI General Functional Requirements Conformance
  - 7.6.2.2.2 HPLPSI Specific Regulatory Requirements Conformance
- 7.6.2.3 Leak Detection System - Instrumentation and Controls
  - 7.6.2.3.1 LDS General Functional Requirements Conformance
  - 7.6.2.3.2 LDS Specific Regulatory Requirements Conformance
- 7.6.2.4 Neutron Monitoring System - Instrumentation and Controls
  - 7.6.2.4.1 Intermediate Range Monitor System
  - 7.6.2.4.2 Local Power Range Monitor System
  - 7.6.2.4.3 Average Power Range Monitor System
- 7.6.2.5 Safety/Relief Valve Position Indication System - Instrumentation and Controls
  - 7.6.2.5.1 SRVPI General Functional Requirements Conformance
  - 7.6.2.5.2 SRVPI Specific Regulatory Requirements Conformance
- 7.6.2.6 Containment Instrument Gas System - ADS Control - Instrumentation and Controls
  - 7.6.2.6.1 CIGS-ADS General Functional Requirements Conformance
  - 7.6.2.6.2 CIGS-ADS Specific Regulatory Requirements Conformance
- 7.6.2.7 Safeguard Piping Fill System - Instrumentation and Controls
  - 7.6.2.7.1 SPFS General Functional Requirements Conformance
  - 7.6.2.7.2 SPFS Specific Regulatory Requirements Conformance
- 7.6.2.8 Redundant Reactivity Control System - Instrumentation and Controls
  - 7.6.2.8.1 RRCS General Functional Requirements Conformance
  - 7.6.2.8.2 RRCS Specific Regulatory Requirements Conformance
- 7.6.2.9 Additional Design Considerations Analyses
  - 7.6.2.9.1 General Plant Safety Analyses
  - 7.6.2.9.2 Cold Water Slug Injection
  - 7.6.2.9.3 Refueling Accidents
  - 7.6.2.9.4 Overpressurization of Low Pressure System
- 7.6.3 References

## 7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

- 7.7.1 Description
  - 7.7.1.1 Reactor Vessel Instrumentation
    - 7.7.1.1.1 RVI Identification
    - 7.7.1.1.2 RVI Power Sources
    - 7.7.1.1.3 RVI Equipment Design
    - 7.7.1.1.4 RVI Environmental Considerations
    - 7.7.1.1.5 RVI Operational Considerations
  - 7.7.1.2 Reactor Manual Control System - Instrumentation and Controls
    - 7.7.1.2.1 RMCS Identification

## LGS UFSAR

- 7.7.1.2.2 RMCS Power Sources
- 7.7.1.2.3 RMCS Equipment Design
- 7.7.1.2.4 RMCS Environmental Considerations
- 7.7.1.2.5 RMCS Operational Considerations
- 7.7.1.3 Recirculation Flow Control System - Instrumentation and Controls
  - 7.7.1.3.1 RFCS Identification
  - 7.7.1.3.2 RFCS Power Sources
  - 7.7.1.3.3 RFCS Equipment Design
  - 7.7.1.3.4 RFCS Environmental Considerations
  - 7.7.1.3.5 RFCS Operational Considerations
- 7.7.1.4 Feedwater Control System - Instrumentation and Controls
  - 7.7.1.4.1 FCS Identification
  - 7.7.1.4.2 FCS Power Sources
  - 7.7.1.4.3 FCS Equipment Design
  - 7.7.1.4.4 FCS Environmental Considerations
  - 7.7.1.4.5 FCS Operational Considerations
- 7.7.1.5 Pressure Regulator and Turbine-Generator System - Instrumentation and Controls
  - 7.7.1.5.1 PRTGS Identification
  - 7.7.1.5.2 PRTGS Power Sources
  - 7.7.1.5.3 PRTGS Equipment Design
  - 7.7.1.5.4 PRTGS Environmental Considerations
  - 7.7.1.5.5 PRTGS Operational Considerations
- 7.7.1.6 Neutron Monitoring System - Instrumentation and Controls
  - 7.7.1.6.1 Source Range Monitor System
  - 7.7.1.6.2 Rod Block Monitor System
  - 7.7.1.6.3 Traversing Incore Probe System
- 7.7.1.7 Deleted
  - 7.7.1.7.1 PCS System Identification
  - 7.7.1.7.2 PCS Power Sources
  - 7.7.1.7.3 PCS Equipment Design
  - 7.7.1.7.4 PCS Environmental Considerations
  - 7.7.1.7.5 PCS Operational Considerations
- 7.7.1.8 Reactor Water Cleanup System - Instrumentation and Controls
  - 7.7.1.8.1 RWCU System Identification
  - 7.7.1.8.2 RWCU Power Sources
  - 7.7.1.8.3 RWCU Equipment Design
  - 7.7.1.8.4 RWCU Environmental Considerations
  - 7.7.1.8.5 RWCU Operational Considerations
- 7.7.1.9 Process Radiation Monitoring Systems - Instrumentation and Controls
  - 7.7.1.9.1 South Stack Effluent Radiation Monitoring System
  - 7.7.1.9.2 Radwaste Equipment Rooms Ventilation Exhaust Radiation Monitoring System
  - 7.7.1.9.3 Charcoal Treatment System Process Exhaust Radiation Monitoring System
  - 7.7.1.9.4 Recombiner Rooms and Hydrogen Analyzer Compartments Exhaust Radiation Monitoring System
  - 7.7.1.9.5 Steam Exhauster Discharge and Vacuum Pump Exhaust Radiation Monitoring System
  - 7.7.1.9.6 Radwaste Enclosure and Chem. Lab Expansion Ventilation Exhaust Radiation Monitoring System
  - 7.7.1.9.7 Air Ejector Offgas Effluent Radiation Monitoring System
  - 7.7.1.9.8 Primary Containment Leak Detector Radiation Monitor
  - 7.7.1.9.9 Hot Maintenance Shop Ventilation Exhaust Radiation Monitoring System

## LGS UFSAR

7.7.1.9.10	Liquid Radwaste Discharge Radiation Monitoring System
7.7.1.9.11	Service Water Radiation Monitoring System
7.7.1.9.12	Reactor Enclosure Cooling Water Radiation Monitoring System
7.7.1.10	Area Radiation Monitoring System - Instrumentation and Controls
7.7.1.10.1	ARMS Identification
7.7.1.10.2	ARMS Power Sources
7.7.1.10.3	ARMS Equipment Design
7.7.1.10.4	ARMS Environmental Considerations
7.7.1.10.5	ARMS Operational Considerations
7.7.1.11	Gaseous Radwaste System - Instrumentation and Controls
7.7.1.11.1	GRS Identification
7.7.1.11.2	GRS Equipment Design
7.7.1.11.3	GRS Environmental Considerations
7.7.1.11.4	GRS Operational Considerations
7.7.1.11.5	GRS Setpoints
7.7.1.12	Liquid Radwaste System - Instrumentation and Controls
7.7.1.12.1	LRS Identification
7.7.1.12.2	LRS Power Sources
7.7.1.12.3	LRS Equipment Design
7.7.1.12.4	LRS Environmental Considerations
7.7.1.12.5	LRS Operational Considerations
7.7.1.13	Solid Radwaste System - Instrumentation and Controls
7.7.1.13.1	SRS Identification
7.7.1.13.2	SRS Power Sources
7.7.1.13.3	SRS Equipment Design
7.7.1.13.4	SRS Environmental Considerations
7.7.1.13.5	SRS Operational Considerations
7.7.1.14	Fuel Pool Cooling and Cleanup System - Instrumentation and Controls
7.7.1.14.1	FPCC Identification
7.7.1.14.2	FPCC Power Sources
7.7.1.14.3	FPCC Equipment Design
7.7.1.14.4	FPCC Environmental Considerations
7.7.1.14.5	FPCC Operational Considerations
7.7.1.15	Refueling Interlocks - Instrumentation and Controls
7.7.1.15.1	RI Identification
7.7.1.15.2	RI Power Sources
7.7.1.15.3	RI Equipment Design
7.7.1.15.4	RI Environmental Considerations
7.7.1.15.5	RI Operational Considerations
7.7.1.16	Leak Detection System - Instrumentation and Controls
7.7.1.16.1	LDS System Identification
7.7.1.16.2	LDS Power Sources
7.7.1.16.3	LDS Equipment Design
7.7.1.16.4	Recirculation Pump Seal Leak Detection System
7.7.1.16.5	Residual Heat Removal Leak Detection System
7.7.1.16.6	Drywell Leak Detection System
7.7.1.16.7	Safety/Relief Valve Leak Detection System
7.7.1.16.8	Reactor Pressure Vessel Head Leak Detection System
7.7.1.16.9	Core Spray System Leak Detection System
7.7.1.17	Emergency Response Facility Data System (Unit 1) -Instrumentation and Controls

## LGS UFSAR

- 7.7.1.17.1 ERFDS Identification
- 7.7.1.17.2 Safety Parameter Display System
- 7.7.1.17.3 Transient Recording and Analysis
- 7.7.1.18 Containment Instrument Gas System - Instrumentation and Controls
  - 7.7.1.18.1 CIGS Identification
  - 7.7.1.18.2 CIGS Power Sources
  - 7.7.1.18.3 CIGS Equipment Design
  - 7.7.1.18.4 CIGS Environmental Considerations
  - 7.7.1.18.5 CIGS Operational Considerations
- 7.7.1.19 Fire Protection and Suppression System - Instrumentation and Controls
  - 7.7.1.19.1 FPSS Identification
  - 7.7.1.19.2 FPSS Power Sources
  - 7.7.1.19.3 FPSS Equipment Design
  - 7.7.1.19.4 FPSS Environmental Considerations
  - 7.7.1.19.5 FPSS Operational Considerations
- 7.7.1.20 Nonsafety-Related Equipment Area Cooling Ventilation Systems - Instrumentation and Controls
  - 7.7.1.20.1 Reactor Enclosure Ventilation System
  - 7.7.1.20.2 Turbine Enclosure and Chem. Lab Expansion Ventilation System
  - 7.7.1.20.3 Radwaste Enclosure Ventilation System
  - 7.7.1.20.4 Hot Maintenance Shop Ventilation System
  - 7.7.1.20.5 Miscellaneous Enclosures Ventilation Systems
- 7.7.1.21 Rod Worth Minimizer (Unit 2) - Instrumentation and Controls
  - 7.7.1.21.1 RWM Identification
  - 7.7.1.21.2 RWM Power Sources
  - 7.7.1.21.3 RWM Equipment Design
  - 7.7.1.21.4 RWM Environmental Considerations
  - 7.7.1.21.5 RWM Operational Considerations
- 7.7.1.22 Plant Monitoring System (Unit 2) - Instrumentation and Controls
  - 7.7.1.22.1 PMS Identification
  - 7.7.1.22.2 PMS Power Sources
  - 7.7.1.22.3 PMS Equipment Design
  - 7.7.1.22.4 PMS Environmental Considerations
  - 7.7.1.22.5 PMS Operational Considerations
- 7.7.2 Analysis
  - 7.7.2.1 Reactor Vessel Instrumentation
    - 7.7.2.1.1 RVI General Functional Requirements Conformance
    - 7.7.2.1.2 RVI Specific Regulatory Requirements Conformance
  - 7.7.2.2 Reactor Manual Control System - Instrumentation and Controls
    - 7.7.2.2.1 RMCS General Functional Requirements Conformance
    - 7.7.2.2.2 RMCS Specific Regulatory Requirements Conformance
    - 7.7.2.2.3 RMCS Power Generation Design Basis
  - 7.7.2.3 Recirculation Flow Control System - Instrumentation and Controls
    - 7.7.2.3.1 RFCS General Functional Requirements Conformance
    - 7.7.2.3.2 RFCS Specific Regulatory Requirements Conformance
    - 7.7.2.3.3 RFCS Power Generation Design Basis
  - 7.7.2.4 Feedwater Control System - Instrumentation and Controls
    - 7.7.2.4.1 FCS General Functional Requirements Conformance
    - 7.7.2.4.2 FCS Specific Regulatory Requirements Conformance
    - 7.7.2.4.3 FCS Power Generation Design Basis

## LGS UFSAR

- 7.7.2.5 Pressure Regulator and Turbine-Generator System - Instrumentation and Controls
  - 7.7.2.5.1 PRTGS General Functional Requirements Conformance
  - 7.7.2.5.2 PRTGS Specific Regulatory Requirements Conformance
  - 7.7.2.5.3 PRTGS General
  - 7.7.2.5.4 PRTGS Power Generation Design Basis
- 7.7.2.6 Neutron Monitoring System - Instrumentation and Controls
  - 7.7.2.6.1 Source Range Monitor System
  - 7.7.2.6.2 Rod Block Monitor System
  - 7.7.2.6.3 Traversing Incore Probe System
- 7.7.2.7 Process Computer System - Instrumentation and Controls
  - 7.7.2.7.1 PCS General Functional Requirements Conformance
- 7.7.2.8 Reactor Water Cleanup System - Instrumentation and Controls
  - 7.7.2.8.1 RWCU General Functional Requirements Conformance
  - 7.7.2.8.2 RWCU Specific Regulatory Requirements Conformance
  - 7.7.2.8.3 RWCU Power Generation Design Basis
- 7.7.2.9 Process Radiation Monitoring Systems - Instrumentation and Controls
  - 7.7.2.9.1 South Stack Effluent Radiation Monitoring System
  - 7.7.2.9.2 Radwaste Equipment Rooms Ventilation Exhaust Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.3 Charcoal Treatment System Process Exhaust Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.4 Recombiner Rooms and Hydrogen Analyzer Compartments Exhaust Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.5 Steam Exhauster Discharge and Vacuum Pump Exhaust Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.6 Radwaste Enclosure Ventilation Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.7 Air Ejector Offgas Effluent Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.8 Primary Containment Leak Detection Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.9 Hot Maintenance Shop Ventilation Exhaust Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.10 Liquid Radwaste Discharge Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.11 Service Water Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.9.12 Reactor Enclosure Cooling Water Radiation Monitoring System - Instrumentation and Controls
- 7.7.2.10 Area Radiation Monitoring System - Instrumentation and Controls
  - 7.7.2.10.1 ARMS General Functional Requirements Conformance
  - 7.7.2.10.2 ARMS Specific Regulatory Requirements Conformance
- 7.7.2.11 Gaseous Radwaste System - Instrumentation and Controls
  - 7.7.2.11.1 GRS General Functional Requirements Conformance
  - 7.7.2.11.2 GRS Specific Regulatory Requirements Conformance
- 7.7.2.12 Liquid Radwaste System - Instrumentation and Controls
  - 7.7.2.12.1 LRS General Functional Requirements Conformance
  - 7.7.2.12.2 LRS Specific Regulatory Requirements Conformance
- 7.7.2.13 Solid Radwaste System - Instrumentation and Controls
  - 7.7.2.13.1 SRS General Functional Requirements Conformance

## LGS UFSAR

7.7.2.13.2	SRS Specific Regulatory Requirements Conformance
7.7.2.14	Fuel Pool Cooling and Cleanup System - Instrumentation and Controls
7.7.2.14.1	FPCC General Functional Requirements Conformance
7.7.2.14.2	FPCC Specific Regulatory Requirements Conformance
7.7.2.15	Refueling Interlocks - Instrumentation and Controls
7.7.2.15.1	RI General Functional Requirements Conformance
7.7.2.15.2	RI Specific Regulatory Requirements Conformance
7.7.2.16	Leak Detection System - Instrumentation and Controls
7.7.2.16.1	LDS General Functional Requirements Conformance
7.7.2.16.2	LDS Specific Regulatory Requirements Conformance
7.7.2.17	Emergency Response Facilities Data System (Unit 1) - Instrumentation and Controls
7.7.2.17.1	ERFDS General Functional Requirements Conformance
7.7.2.17.2	ERFDS Specific Regulatory Requirements Conformance
7.7.2.18	Containment Instrument Gas System - Instrumentation and Controls
7.7.2.18.1	CIGS General Functional Requirements Conformance
7.7.2.18.2	CIGS Specific Regulatory Requirements Conformance
7.7.2.19	Fire Protection and Suppression System - Instrumentation and Controls
7.7.2.19.1	FPSS General Functional Requirements onformance
7.7.2.19.2	FPSS Specific Regulatory Requirements Conformance
7.7.2.20	Nonsafety-Related Equipment Area Cooling Ventilation Systems - Instrumentation and Controls
7.7.2.20.1	Power Generation Design Basis
7.7.2.20.2	General Functional Requirements Conformance
7.7.2.20.3	Specific Regulatory Requirements Conformance
7.7.2.21	Rod Worth Minimizer (Unit 2) - Instrumentation and Controls
7.7.2.21.1	RWM General Functional Requirements Conformance
7.7.2.21.2	RWM Specific Regulatory Requirements Conformance
7.7.2.22	Plant Monitoring System (Unit 2) - Instrumentation and Controls
7.7.2.22.1	PMS General Functional Requirements Conformance
7.7.2.22.2	PMS Specific Regulatory Requirements Conformance

# LGS UFSAR

## CHAPTER 7 - INSTRUMENTATION AND CONTROL SYSTEMS

### LIST OF TABLES

<u>Table</u>	<u>Title</u>
7.1-1	Design and Supply Responsibility
7.1-2	Similarity to Licensed Reactors
7.1-3	Codes and Standards Applicability Matrix
7.1-4	RPS and PCRVICES (De-energize-to-Operate Portions) Separation
7.1-5	Divisional Grouping of Neutron Monitoring System in Drywell Penetrations
7.1-6	System and Subsystem Separation
7.1-7	NRC Bulletins, Circulars, and Information Notices
7.1-8	"First-of-a-Kind" Instruments and Controls
7.2-1	Reactor Protection System Instrumentation Specifications
7.2-2	Trip System Channels Required for Functional Performance of RPS
7.3-1	High Pressure Coolant Injection System Instrument Specifications
7.3-2	Automatic Depressurization System Instrument Specifications
7.3-3	Core Spray System Instrument Specifications
7.3-4	Low Pressure Coolant Injection Instrument Specifications
7.3-5	Primary Containment and Reactor Vessel Isolation Control System Instrument Specifications
7.3-6	Sensors or Circuits in Nonseismically Qualified Structures
7.3-7	Instrument Channels Required for Primary Containment and Reactor Vessel Isolation Control System
7.3-8	High Pressure Coolant Injection System: Number of Trip Channels Required for Functional Performance
7.3-9	Automatic Depressurization System: Number of Trip Channels Required for Functional Performance
7.3-10	Low Pressure Coolant Injection System: Number of Trip Channels Required for Functional Performance

# LGS UFSAR

## LIST OF TABLES (cont'd)

<u>Table</u>	<u>Title</u>
7.3-11	Core Spray System: Number of Trip Channels Required for Functional Performance
7.4-1	Reactor Core Isolation Cooling Instrument Specifications
7.4-2	Reactor Shutdown Cooling Bypasses and Interlocks
7.4-3	Remote Shutdown Panel Instrumentation
7.5-1	Safety-Related Display Instrumentation
7.5-2	Design and Qualification Requirements for Postaccident Monitoring Instrumentation
7.5-3	Postaccident Monitoring Instrumentation
7.5-4	Relative Neutron Flux versus Time
7.5-5	Plant Variables for Accident Monitoring
7.6-1	Process Radiation Monitoring Systems - Instrument Characteristics
7.6-2	IRM System Trips
7.6-3	LPRM System Trips
7.6-4	APRM System Trips
7.6-5	RRCS Trip Logic Response
7.6-6	Radiation Monitoring System Sensor Location
7.6-7	High Pressure/Low Pressure Interlock Equipment
7.6-8	Interlocked Valves on the HPLPSI
7.7-1	CRD Hydraulic System Process Indicators
7.7-2	Locations for Area Radiation Monitoring Sensors
7.7-3	Refueling Interlock Effectiveness
7.7-4	SRM System Trips
7.7-5	RBM System Trips

# LGS UFSAR

## LIST OF TABLES (cont'd)

<u>Table</u>	<u>Title</u>
7.7-6	Analysis Methodology
7.7-7	LGS Water Level
7.7-8	Trend Plot Limit Tags for RPV Control Display
7.7-9	Containment Control Display Trend Plot Limits

# LGS UFSAR

## CHAPTER 7 - INSTRUMENTATION AND CONTROL SYSTEMS

### LIST OF FIGURES

<u>Figure</u>	<u>Title</u>
7.1-1	RPS Separation Concept
7.1-2	PCRVICS Separation Concept
7.1-3	Main Steam Line Isolation Separation Concept
7.1-4	RCIC Sensor Separation Scheme
7.1-5	Typical Isolation Signal Reset Schematic
7.1-6	Typical Drywell Purge Fan Inlet Isolation Valve Schematic
7.2-1	Deleted
7.2-2	Reactor Protection System Scram Functions
7.2-3	Arrangement of RPS Channels and Logics
7.2-4	Scram Contactors and Scram Contactor Actuator Logics (Schematic)
7.2-5	Logics for Trip System A (Schematic)
7.2-6	Relationship Between Neutron Monitoring System and Reactor Protection System
7.2-7	Configuration for Turbine Stop Valve Closure Input to RPS
7.2-8	Configuration for Main Steam Line Isolation Reactor Trip
7.2-9	LPRM Channel Arrangement in the Core and APRM Channel Assignments
7.2-10	Deleted
7.2-11	Deleted
7.2-12	Outline Drawing: 26" Weld End Main Steam Isolation Valve
7.2-13	Piping & Mechanical: Reactor Enclosure, Unit 1, Drywell el 272'-9"
7.2-14	Deleted
7.2-15	Deleted
7.2-16	Deleted

## LGS UFSAR

### LIST OF FIGURES (cont'd)

<u>Figure</u>	<u>Title</u>
7.3-1	Isolation Control System For Main Steam Line Isolation Valves
7.3-2	Isolation Control System Using Motor-Operated Valves
7.3-3	Main Steam Line Isolation Valve Control Diagram
7.3-4	System Level Automatic Initiation Logic ADS, CS, and RHR
7.3-5	Automatic Initiation Logic - HPCI
7.3-6	Emergency Core Cooling System Separation Scheme
7.3-7	Deleted
7.3-8	Deleted
7.3-9	Core Spray System
7.3-10	Deleted
7.3-11	Intentionally Left Blank
7.3-12	Deleted
7.3-13	Deleted
7.3-14	Deleted
7.3-15	Deleted
7.3-16	Deleted
7.3-17	Deleted
7.3-18	Deleted
7.3-19	Deleted
7.3-20	Deleted
7.3-21	Deleted
7.3-22	Deleted
7.3-23	Deleted
7.3-24	Deleted

## LGS UFSAR

### LIST OF FIGURES (cont'd)

<u>Figure</u>	<u>Title</u>
7.3-25	Deleted
7.3-26	Level Sensor Connections
7.4-1	Deleted
7.4-2	Deleted
7.5-1	Deleted
7.5-2	Deleted
7.6-1	Neutron Monitoring System
7.6-2	SRM/IRM Neutron Monitoring Unit
7.6-3	Detector Drive System Schematic
7.6-4	Neutron Monitoring System
7.6-5	Functional Block Diagram of IRM Channel
7.6-6	Power Range Detector Assembly Location
7.6-7	APRM Circuit Arrangement for Reactor Protection System Input
7.6-8	Ranges of Neutron Monitoring System
7.6-9	APRM Tracking Envelope Reduction Power by Flow Control
7.6-10	RRCS Initiation Logic
7.6-11	RRCS ARI Valves
7.7-1	Water Level Range Definition
7.7-2	Deleted
7.7-3	Reactor Manual Control System Operation
7.7-4	Reactor Manual Control Self-Test Provisions
7.7-5	Eleven-Wire Position Probe
7.7-6	Deleted

## LGS UFSAR

### LIST OF FIGURES (cont'd)

<u>Figure</u>	<u>Title</u>	
7.7-7	Recirculation Flow Control	
7.7-7A	Deleted	
7.7-8	Deleted	
7.7-9	Simplified Diagram Turbine Pressure and Speed Load Control Requirements	
7.7-10	Traversing Incore Probe Assembly	
7.7-11	Deleted	
7.7-12	Intentionally Left Blank	
7.7-13	Functional Block Diagram of SRM Channel	
7.7-14	RBM Rod Selection Combinations	
7.7-15	Typical RBM Response to Control Rod Motion (Old vs New LPRM assignments)	
7.7-16	New RBM BCCD <sub>1</sub> /BCCD <sub>2</sub> LPRM assignments	
7.7-17	Power dependent RBM Trip Nomenclature	