
CHAPTER 7— INSTRUMENTATION AND CONTROLS

TABLE OF CONTENTS

7.0	INSTRUMENTATION AND CONTROLS	7.1-1
7.1	Introduction.....	7.1-1
7.1.1	U.S. EPR I&C Architecture	7.1-3
7.1.1.1	Overview	7.1-3
7.1.1.2	Use of TELEPERM XS in the U.S. EPR.....	7.1-4
7.1.1.3	Level 2 - Unit Supervision and Control.....	7.1-6
7.1.1.4	Level 1 - System Automation	7.1-14
7.1.1.5	Level 0 - Process Interface	7.1-28
7.1.1.6	I&C Architecture Design Principles	7.1-35
7.1.2	Identification of Safety Criteria.....	7.1-40
7.1.2.1	Compliance to 10 CFR Parts 50 and 52.....	7.1-41
7.1.2.2	Compliance to 10 CFR Part 50, Appendix A GDC	7.1-42
7.1.2.3	Conformance to Staff Requirements Memoranda...	7.1-46
7.1.2.4	Conformance to Regulatory Guides	7.1-47
7.1.2.5	Conformance to Branch Technical Positions	7.1-51
7.1.2.6	Compliance to IEEE Std 603-1998.....	7.1-53
7.1.3	References	7.1-65
7.2	Reactor Trip System.....	7.2-1
7.2.1	Description.....	7.2-1
7.2.1.1	System Description	7.2-1
7.2.1.2	Reactor Trip Functional Description	7.2-3
7.2.1.3	Permissive Signal Functional Description	7.2-16
7.2.2	Analysis	7.2-21
7.2.2.1	Design Basis Information	7.2-21
7.2.2.2	Failure Modes and Effects Analysis	7.2-22
7.2.2.3	Conformance to Applicable Criteria.....	7.2-24
7.2.3	References	7.2-27

7.3	Engineered Safety Features Systems.....	7.3-1
7.3.1	Description.....	7.3-1
7.3.1.1	System Description	7.3-1
7.3.1.2	Engineered Safety Features Actuation Functional Descriptions.....	7.3-2
7.3.2	Analysis	7.3-22
7.3.2.1	Design Basis Information	7.3-22
7.3.2.2	Failure Modes and Effects Analysis	7.3-24
7.3.2.3	Conformance to Applicable Criteria.....	7.3-26
7.3.3	References	7.3-30
7.4	Systems Required For Safe Shutdown	7.4-1
7.4.1	Description.....	7.4-1
7.4.1.1	I&C Systems Associated with Safe Shutdown	7.4-1
7.4.1.2	Safe Shutdown Using Safety-Related Systems and Equipment	7.4-2
7.4.1.3	Post-fire Safe Shutdown Systems.....	7.4-5
7.4.1.4	Station Blackout Safe Shutdown	7.4-7
7.4.2	Analysis	7.4-7
7.4.2.1	Conformance to General Design Criteria	7.4-7
7.4.2.2	Conformance to 10 CFR 50.55 a(h) and IEEE 603... ..	7.4-7
7.4.2.3	Remote Shutdown Capability	7.4-9
7.4.2.4	Loss of Plant Instrument Air Systems	7.4-9
7.4.2.5	Loss of Cooling Water to Vital Equipment.....	7.4-9
7.4.2.6	Turbine Trip and Plant Load Rejection.....	7.4-9
7.4.3	References	7.4-9
7.5	Information Systems Important to Safety	7.5-1
7.5.1	Description.....	7.5-1
7.5.1.1	Annunciator Systems	7.5-1
7.5.1.2	Accident Monitoring Instrumentation	7.5-2
7.5.1.3	Emergency Response Facilities	7.5-2
7.5.1.4	Bypass and Inoperable Status Indication.....	7.5-2
7.5.2	Analysis	7.5-3
7.5.2.1	Acceptance Criteria	7.5-3
7.5.2.2	Discussion	7.5-5

7.5.3	References	7.5-11
7.6	Interlock Systems Important to Safety.....	7.6-1
7.6.1	Description.....	7.6-1
7.6.1.1	System Description	7.6-1
7.6.1.2	Functional Descriptions.....	7.6-1
7.6.2	Analysis	7.6-6
7.6.2.1	Compliance to Applicable Criteria	7.6-6
7.6.3	References	7.6-8
7.7	CONTROL SYSTEMS NOT REQUIRED FOR SAFETY	7.7-1
7.7.1	DESCRIPTION	7.7-1
7.7.1.1	I&C Systems Related to Core Control.....	7.7-2
7.7.1.2	I&C Systems Related to Plant Control	7.7-3
7.7.2	Design Basis Information.....	7.7-3
7.7.2.1	Operational Core Control Functions.....	7.7-3
7.7.2.2	Operational Plant Control Functions	7.7-8
7.7.2.3	Limitation I&C Functions	7.7-10
7.7.2.4	Non-Safety Control Systems Described in Other Sections.....	7.7-23
7.7.2.5	Safety Classification	7.7-23
7.7.2.6	Effects of Control System Operation Upon Accidents.....	7.7-24
7.7.2.7	Effects of Control System Failures	7.7-24
7.7.2.8	Environmental Control System.....	7.7-25
7.7.2.9	Independence.....	7.7-25
7.7.2.10	Interactions between Safety and Non Safety I&C Systems.....	7.7-25
7.7.2.11	Defense in Depth and Diversity.....	7.7-25
7.7.2.12	Potential for Inadvertent Actuation	7.7-25
7.7.2.13	Control of Access	7.7-26
7.7.3	Analysis	7.7-26
7.7.4	References	7.7-26
7.8	Diverse I&C Systems	7.8-1
7.8.1	Description.....	7.8-2
7.8.1.1	Systems Description.....	7.8-2



7.8.1.2	Functional Descriptions	7.8-3
7.8.2	Analysis	7.8-8
7.8.2.1	Regulatory Requirements.....	7.8-8
7.8.2.2	Evaluation of NUREG/CR-6303 Guidelines	7.8-9
7.8.3	References	7.8-11
7.9	Data Communication Systems	7.9-1