

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
CHAPTER 14 INITIAL TEST PROGRAM		14.1-1
14.1 Specific Information to be Included in Preliminary/Final Safety Analysis Reports.....		14.1-1
14.2 Specific Information to be Included in Standard Safety Analysis Reports		14.2-1
14.2.1 Summary of Test Program and Objectives		14.2-1
14.2.1.1 Construction and Installation Test Program Objectives.....		14.2-2
14.2.1.2 Preoperational Test Program Objectives		14.2-2
14.2.1.3 Startup Test Program Objectives		14.2-3
14.2.2 Organization, Staffing, and Responsibilities		14.2-4
14.2.3 Test Specifications and Test Procedures		14.2-4
14.2.3.1 Conduct of Test Program.....		14.2-5
14.2.3.2 Review of Test Results		14.2-6
14.2.3.3 Test Records.....		14.2-6
14.2.4 Compliance of Test Program with Regulatory Guides		14.2-6
14.2.5 Utilization of Reactor Operating and Testing Experience in the Development of Test Program		14.2-6
14.2.6 Use of Plant Operating and Emergency Procedures		14.2-9
14.2.7 Initial Fuel Loading and Initial Criticality.....		14.2-9
14.2.7.1 Initial Fuel Loading		14.2-10
14.2.7.2 Initial Criticality		14.2-11
14.2.7.3 Power Ascension		14.2-12
14.2.8 Test Program Schedule.....		14.2-12
14.2.9 Preoperational Test Descriptions.....		14.2-13
14.2.9.1 Preoperational Tests of Systems with Safety-Related Functions.....		14.2-13
14.2.9.1.1 Reactor Coolant System Testing.....		14.2-13
14.2.9.1.2 Steam Generator System Testing.....		14.2-17
14.2.9.1.3 Passive Core Cooling System Testing		14.2-19
14.2.9.1.4 Passive Containment Cooling System Testing		14.2-24
14.2.9.1.5 Chemical and Volume Control System Isolation Testing.....		14.2-26
14.2.9.1.6 Main Control Room Emergency Habitability System Testing.....		14.2-27
14.2.9.1.7 Expansion, Vibration and Dynamic Effects Testing.....		14.2-28
14.2.9.1.8 Control Rod Drive System		14.2-31
14.2.9.1.9 Reactor Vessel Internals Vibration Testing		14.2-32
14.2.9.1.10 Containment Isolation and Leak Rate Testing		14.2-33
14.2.9.1.11 Containment Hydrogen Control System Testing		14.2-34
14.2.9.1.12 Protection and Safety Monitoring System Testing		14.2-35
14.2.9.1.13 Incore Instrumentation System Testing		14.2-38
14.2.9.1.14 Class 1E DC Power and Uninterruptible Power Supply Testing.....		14.2-39

TABLE OF CONTENTS (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
14.2.9.1.15	Fuel Handling and Reactor Component Servicing Equipment Test	14.2-40
14.2.9.1.16	Long-Term Safety-Related System Support Testing	14.2-43
14.2.9.2	Preoperational Testing of Defense-in-Depth Systems	14.2-44
14.2.9.2.1	Main Steam System Testing	14.2-44
14.2.9.2.2	Main and Startup Feedwater System	14.2-45
14.2.9.2.3	Chemical and Volume Control System Testing.....	14.2-46
14.2.9.2.4	Normal Residual Heat Removal System Testing.....	14.2-47
14.2.9.2.5	Component Cooling Water System Testing.....	14.2-49
14.2.9.2.6	Service Water System Testing	14.2-50
14.2.9.2.7	Spent Fuel Pool Cooling System Testing	14.2-51
14.2.9.2.8	Fire Protection System Testing.....	14.2-52
14.2.9.2.9	Central Chilled Water System Testing	14.2-53
14.2.9.2.10	Nuclear Island Nonradioactive Ventilation System Testing	14.2-54
14.2.9.2.11	Radiologically Controlled Area Ventilation System.....	14.2-56
14.2.9.2.12	Plant Control System Testing	14.2-57
14.2.9.2.13	Data Display and Processing System Testing.....	14.2-58
14.2.9.2.14	Diverse Actuation System Testing	14.2-59
14.2.9.2.15	Main AC Power System Testing	14.2-61
14.2.9.2.16	Non-Class 1E dc and Uninterruptible Power Supply System Testing	14.2-62
14.2.9.2.17	Standby Diesel Generator Testing	14.2-63
14.2.9.2.18	Radiation Monitoring System Testing	14.2-64
14.2.9.2.19	Plant Lighting System Testing.....	14.2-65
14.2.9.2.20	Primary Sampling System Testing.....	14.2-66
14.2.9.2.21	Annex/Auxiliary Building Non-radioactive HVAC System.....	14.2-67
14.2.9.3	Preoperational Testing of Nonsafety-Related Radioactive Systems.....	14.2-68
14.2.9.3.1	Liquid Radwaste System Testing	14.2-68
14.2.9.3.2	Gaseous Radwaste System Testing.....	14.2-69
14.2.9.3.3	Solid Radwaste System Testing.....	14.2-70
14.2.9.3.4	Radioactive Waste Drain System Testing.....	14.2-71
14.2.9.3.5	Steam Generator Blowdown System Testing	14.2-71
14.2.9.3.6	Waste Water System Testing.....	14.2-72
14.2.9.4	Preoperational Tests of Additional Nonsafety-Related Systems.....	14.2-73
14.2.9.4.1	Condensate System Testing	14.2-73
14.2.9.4.2	Condenser Air Removal System Testing.....	14.2-74
14.2.9.4.3	Main Turbine System and Auxiliaries Testing	14.2-74
14.2.9.4.4	Main Generator System and Auxiliaries Testing.....	14.2-75

TABLE OF CONTENTS (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
14.2.9.4.5	Turbine Building Closed Cooling Water System Testing.....	14.2-76
14.2.9.4.6	Circulating Water System Testing.....	14.2-76
14.2.9.4.7	Turbine Island Chemical Feed System Testing	14.2-77
14.2.9.4.8	Condensate Polishing System Testing.....	14.2-78
14.2.9.4.9	Demineralized Water Transfer and Storage System Testing.....	14.2-78
14.2.9.4.10	Compressed and Instrument Air System Testing.....	14.2-79
14.2.9.4.11	Containment Recirculation Cooling System Testing.....	14.2-80
14.2.9.4.12	Containment Air Filtration System Testing.....	14.2-80
14.2.9.4.13	Plant Communications System Testing	14.2-81
14.2.9.4.14	Mechanical Handling System Crane Testing.....	14.2-82
14.2.9.4.15	Seismic Monitoring System Testing.....	14.2-82
14.2.9.4.16	Special Monitoring System Testing.....	14.2-83
14.2.9.4.17	Secondary Sampling System Testing.....	14.2-84
14.2.9.4.18	Turbine Building Ventilation System.....	14.2-85
14.2.9.4.19	Health Physics and Hot Machine Shop HVAC System....	14.2-85
14.2.9.4.20	Radwaste Building HVAC System.....	14.2-86
14.2.9.4.21	Main, Unit Auxiliary and Reserve Auxiliary Transformer Test	14.2-87
14.2.10	Startup Test Procedures.....	14.2-88
14.2.10.1	Initial Fuel Loading and Precritical Tests	14.2-88
14.2.10.1.1	Fuel Loading Prerequisites and Periodic Checks.....	14.2-88
14.2.10.1.2	Reactor Systems Sampling for Fuel Loading	14.2-89
14.2.10.1.3	Fuel Loading Instrumentation and Neutron Source Requirements.....	14.2-90
14.2.10.1.4	Inverse Count Rate Ratio Monitoring for Fuel Loading....	14.2-91
14.2.10.1.5	Initial Fuel Loading	14.2-92
14.2.10.1.6	Post-Fuel Loading Precritical Test Sequence	14.2-94
14.2.10.1.7	Incore Instrumentation System Precritical Verification	14.2-94
14.2.10.1.8	Resistance Temperature Detectors-Incore Thermocouple Cross Calibration.....	14.2-95
14.2.10.1.9	Nuclear Instrumentation System Precritical Verification....	14.2-96
14.2.10.1.10	Setpoint Precritical Verification	14.2-97
14.2.10.1.11	Rod Control System	14.2-98
14.2.10.1.12	Rod Position Indication System.....	14.2-98
14.2.10.1.13	Control Rod Drive Mechanisms	14.2-99
14.2.10.1.14	Rod Drop Time Measurement	14.2-100
14.2.10.1.15	Rapid Power Reduction System	14.2-100
14.2.10.1.16	Process Instrumentation Alignment.....	14.2-101
14.2.10.1.17	Reactor Coolant System Flow Measurement.....	14.2-102
14.2.10.1.18	Reactor Coolant System Flow Coastdown.....	14.2-102

TABLE OF CONTENTS (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
14.2.10.1.19	Pressurizer Spray Capability and Continuous Spray Flow Verification	14.2-103
14.2.10.1.20	Feedwater Valve Stroke Test.....	14.2-103
14.2.10.2	Initial Criticality Tests	14.2-104
14.2.10.2.1	Initial Criticality Test Sequence	14.2-104
14.2.10.2.2	Initial Criticality	14.2-105
14.2.10.2.3	Nuclear Instrumentation System Verification.....	14.2-105
14.2.10.2.4	Post-Critical Reactivity Computer Checkout.....	14.2-106
14.2.10.3	Low Power Tests	14.2-107
14.2.10.3.1	Low-Power Test Sequence	14.2-107
14.2.10.3.2	Determination of Physics Testing Range.....	14.2-108
14.2.10.3.3	Boron Endpoint Determination	14.2-108
14.2.10.3.4	Isothermal Temperature Coefficient Measurement.....	14.2-109
14.2.10.3.5	Bank Worth Measurement.....	14.2-110
14.2.10.3.6	Natural Circulation (First Plant Only)	14.2-111
14.2.10.3.7	Passive Residual Heat Removal Heat Exchanger (First Plant Only).....	14.2-112
14.2.10.4	Power Ascension Tests.....	14.2-114
14.2.10.4.1	Test Sequence.....	14.2-114
14.2.10.4.2	Incore Instrumentation System	14.2-114
14.2.10.4.3	Nuclear Instrumentation System.....	14.2-115
14.2.10.4.4	Setpoint Verification	14.2-116
14.2.10.4.5	Startup Adjustments of Reactor Control Systems.....	14.2-116
14.2.10.4.6	Rod Cluster Control Assembly Out of Bank Measurements (First Plant Only).....	14.2-117
14.2.10.4.7	Axial Flux Difference Instrumentation Calibration	14.2-118
14.2.10.4.8	Primary and Secondary Chemistry	14.2-119
14.2.10.4.9	Process Measurement Accuracy Verification	14.2-119
14.2.10.4.10	Process Instrumentation Alignment at Power Conditions	14.2-120
14.2.10.4.11	Reactor Coolant System Flow Measurement at Power Conditions	14.2-121
14.2.10.4.12	Steam Dump Control System	14.2-121
14.2.10.4.13	Steam Generator Level Control System.....	14.2-122
14.2.10.4.14	Radiation and Effluent Monitoring System	14.2-123
14.2.10.4.15	Ventilation Capability	14.2-124
14.2.10.4.16	Biological Shield Survey	14.2-125
14.2.10.4.17	Thermal Power Measurement and Statepoint Data Collection	14.2-125
14.2.10.4.18	Dynamic Response	14.2-126
14.2.10.4.19	Reactor Power Control System.....	14.2-127

TABLE OF CONTENTS (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
	14.2.10.4.20 Load Swing Test.....	14.2-127
	14.2.10.4.21 100 Percent Load Rejection.....	14.2-128
	14.2.10.4.22 Load Follow Demonstration (First Plant Only)	14.2-129
	14.2.10.4.23 Hot Full Power Boron Endpoint.....	14.2-130
	14.2.10.4.24 Plant Trip from 100 Percent Power	14.2-131
	14.2.10.4.25 Thermal Expansion	14.2-131
	14.2.10.4.26 Loss of Offsite Power	14.2-132
	14.2.10.4.27 Feedwater Heater Loss and Out of Service Test.....	14.2-133
	14.2.10.4.28 Remote Shutdown Workstation.....	14.2-134
14.3	Certified Design Material	14.3-1
	14.3.1 CDM Section 1.0, Introduction	14.3-2
	14.3.2 CDM Section 2.0, System Based Design Descriptions and ITAAC	14.3-3
	14.3.2.1 Design Descriptions	14.3-3
	14.3.2.2 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC).....	14.3-7
	14.3.3 CDM Section 3.0, Non-System Based Design Descriptions and ITAAC	14.3-10
	14.3.4 Certified Design Material Section 4.0, Interface Requirements	14.3-10
	14.3.5 CDM Section 5.0, Site Parameters.....	14.3-10
	14.3.6 Initial Test Program.....	14.3-11
	14.3.7 Elements of AP1000 Design Material Incorporated into the Certified Design Material.....	14.3-11
	14.3.8 Summary	14.3-12
	14.3.9 References	14.3-12
14.4	Combined License Applicant Responsibilities	14.4-1
	14.4.1 Organization and Staffing	14.4-1
	14.4.2 Test Specifications and Procedures	14.4-1
	14.4.3 Conduct of Test Program	14.4-1
	14.4.4 Review and Evaluation of Test Results.....	14.4-2
	14.4.5 Interface Requirements.....	14.4-2
	14.4.6 First-Plant-Only and Three-Plant-Only Tests	14.4-2
	14.4.7 References	14.4-3

LIST OF TABLES

<u>Table No.</u>	<u>Title</u>	<u>Page</u>
Table 14.3-1	ITAAC Screening Summary (Sheets 1 – 4).....	14.3-13
Table 14.3-2	Design Basis Accident Analysis (Sheets 1 – 17)	14.3-17
Table 14.3-3	Anticipated Transient Without Scram	14.3-34
Table 14.3-4	Fire Protection (Sheets 1 – 2)	14.3-35
Table 14.3-5	Flood Protection (Sheets 1 – 2)	14.3-37
Table 14.3-6	Probabilistic Risk Assessment (Sheets 1 – 10)	14.3-39
Table 14.3-7	Radiological Analysis (Sheets 1 – 3).....	14.3-49
Table 14.3-8	Severe Accident Analysis	14.3-52