CHAPTER 14

VERIFICATION PROGRAMS

TABLE OF CONTENTS

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ac | alternating current |
| COL | Combined License |
| COLA | Combined License Application |
| CPNPP | Comanche Peak Nuclear Power Plant |
| CRDM | control rod drive mechanism |
| CVCS | chemical and volume control system |
| DAS | diverse actuation system |
| dc | direct current |
| DCD | Design Control Document |
| ECCS | emergency core cooling system |
| ESF | engineered safety features |
| ESW | essential service water |
| ESWS | essential service water system |
| FSAR | Final Safety Analysis Report |
| HVAC | heating, ventilation, and air conditioning |
| ITAAC | inspections, tests, analyses, and acceptance criteria |
| ITP | initial test program |
| LOOP | loss of offsite power |
| MCR | main control room |
| MFIV | main feedwater isolation valve |
| MHI | Mitsubishi Heavy Industries, Ltd |
| MNES | Mitsubishi Nuclear Energy Systems, Inc. |
| MSIV | main steam isolation valve |
| NDE | nondestructive examination |
| non-ESW | non-essential service water |
| NRC | U.S. Nuclear Regulatory Commission |
| PMWS | primary makeup water system |
| PWR | pressurized-water reactor |
| RCP | reactor coolant pump |
| RCS | reactor coolant system |
| RG | Regulatory Guide |
| RHRS | residual heat removal system |
| RTD | resistance temperature detector |
| SDV | safety depressurization valve |
| SFPCS | spent fuel pit cooling and purification system |
| SIS | safety injection system |

ACRONYMS AND ABBREVIATIONS (Continued)

| | |
|---|---|
| SSC | structure, system, and component |
| UHS | ultimate heat sink |

# 14.0 VERIFICATION PROGRAMS

## 14.1 SPECIFIC INFORMATION TO BE INCLUDED IN PRELIMINARY/FINAL SAFETY ANALYSIS REPORT

This section of the referenced Design Control Document (DCD) is incorporated by reference with no departures or supplements.

## 14.2 INITIAL PLANT TEST PROGRAM

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

### 14.2.1 Summary of Test Program and Objectives

STD COL 14.2(1) Replace the last two paragraphs in DCD Subsection 14.2.1 with the following.

The initial test program (ITP) described in this chapter addresses both US-APWR and site-specific systems and components. The test program includes administrative controls for testing components and systems, which are described in this chapter.

### 14.2.2 Organization and Staffing

CP COL 14.2(2) Replace the last paragraph in DCD Subsection 14.2.2 with the following.

Appendix 14AA provides a description of the organizations responsible for all phases of the ITP, and a description of the administrative controls that assure that experienced and qualified supervisory personnel and other principal participants are responsible for managing, developing, and conducting the ITP.

### 14.2.3 Test Procedures

CP COL 14.2(3) Replace the last two paragraphs in DCD Subsection 14.2.3 with the following.

The process used to develop test specifications and test procedures is described in Appendix 14AA. Table 13.4-201 provides the milestone for the implementation of the ITP.

### 14.2.4 Conduct of Test Program

CP COL 14.2(4) Replace the last paragraph in DCD Subsection 14.2.4 with the following.

Appendix 14AA provides a description of the administrative controls that govern the conduct of the test program. These controls include requirements that govern the activities of the startup organization and their interface with other organizations.

### 14.2.5 Review, Evaluation, and Approval of Test Results

CP COL 14.2(5) Replace the last paragraph in DCD Subsection 14.2.5 with the following.

Appendix 14AA provides a description of the specific controls for the review, evaluation, and approval of the test results of the test program by appropriate personnel and/or organizations, including the methods and schedules for approval of test data for each major phase.

### 14.2.6 Test Records

CP COL 14.2(6) Replace the last paragraph in DCD Subsection 14.2.6 with the following

Appendix 14AA provides a description of the specific controls for the preparation and retention of test records.

### 14.2.9 Trial Testing of Plant Operating and Emergency Procedures

CP COL 14.2(7*)* Replace the last paragraph in DCD Subsection 14.2.9 with the following.

A schedule for the development of plant procedures required for use during preoperational testing will be provided to the U.S. Nuclear Regulatory Commission (NRC) 12 months prior to the start of the corresponding preoperational tests. A schedule for the development of plant procedures required for use during startup testing is provided to the NRC 12 months prior to the start of fuel loading. The schedules provide sufficient detail to assure that the procedures required to support testing are available for test procedure preparation, review and performance.

### 14.2.11 Test Program Schedule

CP COL 14.2(8) Replace the first and second sentences of the last paragraph in DCD Subsection 14.2.11 with the following.

An event-based schedule for conducting each major phase of the test program for the Comanche Peak Nuclear Power Plant (CPNPP) Units 3 and 4, relative to the start of fuel loading, will be provided to the NRC six months prior to the start of preoperational testing. The schedule will be periodically updated to reflect actual progress. Schedule preparation will include an assessment of overlapping test program schedules between CPNPP Units 3 and 4 and provide assurance that CPNPP Unit 3 will be given priority during the period when testing and plant staff personnel will be working on both units.

CP COL 14.2(9) Replace the third sentence of the last paragraph in DCD Subsection 14.2.11 with the following.

Preoperational tests which satisfy inspections, tests analyses, and acceptance criteria (ITAAC) test requirements, and ITAAC test requirements which can be incorporated into preoperational tests, are correlated in Table 14.2-202. This correlation is used to assure that ITAAC test requirements are included in the development of preoperational testing procedures.

### 14.2.12 Individual Test Descriptions

CP COL 14.2(10) Replace the last paragraph and bullet in DCD Subsection 14.2.12 with the following.

Testing outside the scope of the certified design is addressed in Subsections 14.2.12.1.112, 14.2.12.1.113, and 14.2.12.1.114. Table 14.2-201 shows the comprehensive list for the new added subsections.

### 14.2.12.1 Preoperational Tests

Add new subsections after DCD Subsection 14.2.12.1.111 as follow.

STD COL 14.2(10)

### 14.2.12.1.112 Personnel Monitors and Radiation Survey Instruments Preoperational Test

A. Objective

1. To demonstrate the operation, indication, and alarm functions of radiological personnel monitors and radiation survey instruments.

B. Prerequisites

1. Required construction testing is completed.
2. Test instrumentation is available and calibrated.
3. Required support systems are available.
4. Indicators, power supplies, and sensors have been calibrated as required in accordance with vendor instructions.

C. Test Method

1. Performance of each monitor and survey unit is observed and recorded during individual component tests for each unit during calibration using standard radiation sources, including verification of all alarms, annunciators, and indicators, operation of bypass, interlock, permissive, self-test and loss of power functions, as applicable.

D. Acceptance Criterion

1. Component and, where applicable, integrated testing demonstrates that each monitor or survey unit operates as specified by vendor technical information and plant procedures, including the following, as applicable:

   i. Alarms, annunciators, and indicators.

   ii. Bypass, interlock, permissive, self-test, and loss of power functions.

CP COL 14.2(10)

### 14.2.12.1.113 Ultimate Heat Sink (UHS) System Preoperational Test

A. Objectives

1. To demonstrate operation of the UHS cooling towers and associated fans, essential service water (ESW) pumps, and UHS transfer pumps.
2. With the basin at minimum level (end of the 30 day emergency period), to demonstrate that the ESW pumps maintain design flow rates.

3. To demonstrate the operation of the UHS transfer pumps and associated interlocks.
4. To demonstrate the operation of the UHS basin water level sensors and basin water level controls, and water chemistry monitors, controls, interlocks, and associated blowdown equipment.

B. Prerequisites

1. Required construction testing is completed.
2. Component testing and instrument calibration is completed.
3. Test instrumentation is available and calibrated.
4. Required support systems are available.
5. Required system flushing/cleaning is completed.
6. Required electrical power supplies and control circuits are energized and operational.
7. Makeup water to the UHS basins is available.

C. Test Method

1. System component control and interlock circuits and alarms are verified, including cooling tower fan logic, basin water level sensors, makeup water control, basin process chemical sensors, blowdown control valves, and UHS transfer pump interlocks.
2. The performance of each ESW pump is monitored as basin water level is decreased to the minimum water level (end of the 30 day emergency period).
3. Basin water level and chemistry controls are monitored during continuous operations in the water level and chemistry control mode.

D. Acceptance Criteria

1. With the basin at minimum level (end of the 30 day emergency period), each ESW pump maintains design flow rates.
2. UHS transfer pumps and associated interlocks operate as discussed in Subsection 9.2.5.
3. UHS basin water level sensors and basin water level controls, and water chemistry monitors, controls, interlocks and associated blowdown equipment operate as discussed in Subsection 9.2.5.

CP COL 14.2(10)

### 14.2.12.1.114 UHS ESW Pump House Ventilation System Preoperational Test

A. Objectives

1. To demonstrate operation of the UHS ESW pump house ventilation system.

B. Prerequisites

1. Required construction testing is completed.
2. Component testing and instrument calibration are completed.
3. Test instrumentation is available and calibrated.
4. Required support systems are available.

C. Test Method

1. Simulate interlock signals for each exhaust fan and verify operation and annunciation.
2. Verify that alarms and status indications are functional.
3. Verify design airflow.

D. Acceptance Criteria

1. UHS ESW pump house ventilation system operates on the proper signal (see Subsection 9.4.5).
2. All alarms annunciate properly.

### 14.2.13 Combined License Information

Replace the content of DCD Subsection 14.2.13 with the following.

STD COL 14.2(1) ***14.2(1)*** *Summary of test program*

*This Combined License (COL) item is addressed in Subsection 14.2.1 and Appendix 14AA.*

CP COL 14.2(2) ***14.2(2)*** *Organization and staffing*

*This COL item is addressed in Subsection 14.2.2 and Appendix 14AA.*

CP COL 14.2(3) ***14.2(3)*** *Test specifications and test procedures*

*This COL item is addressed in Subsection 14.2.3 and Appendix 14AA.*

CP COL 14.2(4) ***14.2(4)*** *Conduct of test program*

*This COL item is addressed in Subsection 14.2.4 and Appendix 14AA.*

CP COL 14.2(5) ***14.2(5)*** *Review, evaluation, and approval of test results*

*This COL item is addressed in Subsection 14.2.5 and Appendix 14AA.*

CP COL 14.2(6) ***14.2(6)*** *Test records*

*This COL item is addressed in Subsection 14.2.6 and Appendix 14AA.*

CP COL 14.2(7) ***14.2(7)*** *Trial testing of plant operating and emergency procedures*

*This COL item is addressed in Subsection 14.2.9*

CP COL 14.2(8) ***14.2(8)*** *Test program schedule*

*This COL item is addressed in Subsection 14.2.11.*

CP COL 14.2(9) ***14.2(9)*** *Cross-reference between each test and ITAAC requirements*

*This COL item is addressed in Subsection 14.2.11 and Table 14.2-202.*

CP COL 14.2(10) ***14.2(10)*** *Site-specific test abstracts*

STD COL 14.2(10) *This COL item is addressed in Subsections 14.2.12.1.112, 14.2.12.1.113, and 14.2.12.1.114, Table 14.2-201, and Appendix 14A.*

**Table 14.2-201**

**Comprehensive Listing of Additional Tests**

| | Section | Test |
|---|---|---|
| STD COL 14.2(10) | 14.2.12.1.112 | Personnel Monitors and Radiation Survey Instruments Preoperational Test |
| CP COL 14.2(10) | 14.2.12.1.113 | Ultimate Heat Sink (UHS) Preoperational Test |
| CP COL 14.2(10) | 14.2.12.1.114 | UHS ESW Pump House Ventilation System Preoperational Test |

CP COL 14.2(9)

**Table 14.2-202 (Sheet 1 of 5)**

**Comparison of Tier 2 Preoperational Tests with Tier 1 Test Requirements**

| Test Description | Tier 2 Section | Tier 1 Section |
|---|---|---|
| Reactor coolant system (RCS) Hot Functional | 14.2.12.1.1 | 2.4.2 |
| Pressurizer Pressure and Water Level Control | 14.2.12.1.2 | - |
| Reactor coolant pump (RCP) Initial Operation | 14.2.12.1.3 | 2.4.2 |
| Pressurizer Safety Depressurization Valve (SDV) | 14.2.12.1.4 | - |
| Pressurizer Relief Tank | 14.2.12.1.5 | - |
| RCS | 14.2.12.1.6 | 2.4.2 |
| Reactor Internals Vibration | 14.2.12.1.7 | 2.4.1 |
| RCS Cold Hydrostatic | 14.2.12.1.8 | 2.2, 2.4.1, 2.4.2 |
| Reactor Control, Rod Control, and Rod Position Indication | 14.2.12.1.9 | (2.5.5) |
| Control rod drive mechanism (CRDM) Motor Generator Set | 14.2.12.1.10 | - |
| CRDM Initial Timing | 14.2.12.1.11 | - |
| Chemical and Volume Control System (CVCS) – Boric Acid Blending | 14.2.12.1.12 | 2.4.6 |
| CVCS – Charging and Seal Water | 14.2.12.1.13 | 2.4.6 |
| CVCS – Letdown | 14.2.12.1.14 | 2.4.6 |
| RCS Lithium Addition and Distribution | 14.2.12.1.15 | - |
| Primary Makeup Water System (PMWS) | 14.2.12.1.16 | (2.7.6.11) |
| Reactor Trip System and engineered safety features (ESF) System Response Time | 14.2.12.1.17 | - |
| Reactor Trip System and ESF System Logic | 14.2.12.1.18 | 2.5.1, 2.7.1.1 |
| Resistance Temperature Detectors (RTDs)/Thermocouple Cross-Calibration | 14.2.12.1.19 | - |
| Diverse Actuation System (DAS) Actuation | 14.2.12.1.20 | 2.5.3 |
| Main Steam Supply System | 14.2.12.1.21 | 2.7.1.2, (2.7.1.6) |
| Residual Heat Removal System (RHRS) | 14.2.12.1.22 | 2.4.5 |
| Main Steam Isolation Valve (MSIV), Main Feedwater Isolation Valve (MFIV), and Main Steam Check Valve | 14.2.12.1.23 | 2.7.1.2, 2.7.1.9 |
| Motor-Driven Emergency Feedwater System | 14.2.12.1.24 | 2.7.1.11 |
| Turbine-Driven Emergency Feedwater System | 14.2.12.1.25 | 2.7.1.11 |
| Extraction Steam | 14.2.12.1.26 | (2.7.1.1) |

**Table 14.2-202 (Sheet 2 of 5)**

**Comparison of Tier 2 Preoperational Tests with Tier 1 Test Requirements**

| Test Description | Tier 2 Section | Tier 1 Section |
|---|---|---|
| Main Turbine System Valves | 14.2.12.1.27 | 2.7.1.1 |
| Condensate System | 14.2.12.1.28 | (2.7.1.9) |
| Feedwater System | 14.2.12.1.29 | (2.7.1.9) |
| Feedwater Heater and Drain Systems | 14.2.12.1.30 | (2.7.1.9) |
| Condensate Polishing System | 14.2.12.1.31 | (2.7.1.8) |
| Main Condenser Evacuation System | 14.2.12.1.32 | (2.7.1.4) |
| Circulating Water System | 14.2.12.1.33 | (2.7.1.7) |
| Essential Service Water System (ESWS) | 14.2.12.1.34 | 2.7.3.1 |
| Main and Unit Auxiliary Transformers | 14.2.12.1.35 | 2.6.1 |
| Reserve Auxiliary Transformers | 14.2.12.1.36 | (2.6.1) |
| Non-Class 1E Alternating Current (ac) Distribution | 14.2.12.1.37 | (2.6.1) |
| 6.9 kV Class 1E System | 14.2.12.1.38 | 2.6.1 |
| 480 V Class 1E Switchgear | 14.2.12.1.39 | (2.6.1) |
| 480 V Class 1E Motor Control Center | 14.2.12.1.40 | (2.6.1) |
| 120 V ac Class 1E | 14.2.12.1.41 | 2.5.1, 2.6.3 |
| Emergency Lighting System | 14.2.12.1.42 | (2.6.6) |
| Normal Lighting System | 14.2.12.1.43 | (2.6.6) |
| Class 1E Gas Turbine Generator | 14.2.12.1.44 | 2.6.4 |
| Class 1E Bus Load Sequence | 14.2.12.1.45 | 2.4.1, 2.4.2, 2.4.4, 2.4.5, 2.4.6, 2.5.1, 2.6.1, 2.6.3, 2.6.4, 2.7.1.2, 2.7.1.9, 2.7.1.10, 2.7.1.11, 2.7.3.1, 2.7.3.3, 2.7.3.5, 2.7.5.1, 2.7.5.2, 2.7.5.4, 2.7.6.3, 2.7.6.6, 2.7.6.7, 2.7.6.13, 2.11.2, 2.11.3 |
| Alternate ac Power Sources for Station Black Out | 14.2.12.1.46 | 2.6.5 |
| 125 V Direct Current (dc) Class 1E | 14.2.12.1.47 | 2.4.1, 2.4.2, 2.4.4, 2.4.5, 2.4.6, 2.5.1, 2.6.2, 2.6.3, 2.7.1.2, 2.7.1.9, 2.7.1.10, 2.7.1.11, 2.7.3.1, 2.7.3.3, 2.7.3.5, 2.7.5.1, 2.7.5.2, 2.7.5.4, 2.7.6.3, 2.7.6.6, 2.7.6.7, 2.7.6.13, 2.11.2, 2.11.3 |

**Table 14.2-202 (Sheet 3 of 5)**

**Comparison of Tier 2 Preoperational Tests with Tier 1 Test Requirements**

| Test Description | Tier 2 Section | Tier 1 Section |
|---|---|---|
| 125 V DC Class 1E Minimum Load Voltage Verification | 14.2.12.1.48 | - |
| 125 V DC non-Class 1E | 14.2.12.1.49 | - |
| Dynamic State Vibration Monitoring of Safety Related and High-Energy Piping | 14.2.12.1.50 | - |
| Steady State Vibration Monitoring of Safety Related and High-Energy Piping | 14.2.12.1.51 | - |
| Thermal Expansion Testing | 14.2.12.1.52 | - |
| Class 1E Gas Turbine Generator Sequence – Loss of Offsite Power (LOOP) Sequence and LOOP Sequence with Emergency Core Cooling System (ECCS) Actuation Signal | 14.2.12.1.53 | 2.6.4 |
| Safety Injection System (SIS) | 14.2.12.1.54 | 2.4.4 |
| ECCS Actuation and Containment Isolation Logic | 14.2.12.1.55 | 2.4.4, 2.11.2 |
| Safety Injection Check Valve | 14.2.12.1.56 | 2.4.4 |
| Safety Injection Accumulator | 14.2.12.1.57 | 2.4.4 |
| Containment Spray System | 14.2.12.1.58 | 2.11.3 |
| Refueling Water Storage System | 14.2.12.1.59 | - |
| Essential Chilled Water System | 14.2.12.1.60 | 2.7.3.5 |
| Containment Structural Integrity | 14.2.12.1.61 | 2.2 |
| Containment Local Leakrate | 14.2.12.1.62 | 2.11.2 |
| Containment Integrated Leak Rate | 14.2.12.1.63 | 2.2 |
| Containment Hydrogen Monitoring and Control System | 14.2.12.1.64 | (2.11.4) |
| CRDM Cooling System | 14.2.12.1.65 | (2.7.5.3) |
| Reactor Cavity Cooling System | 14.2.12.1.66 | (2.7.5.3) |
| Containment High Volume Purge System | 14.2.12.1.67 | 2.8, (2.7.5.3) |
| Containment Low Volume Purge System | 14.2.12.1.68 | 2.8, (2.7.5.3) |
| Containment Fan Cooler System | 14.2.12.1.69 | (2.7.5.3) |
| Annulus Emergency Exhaust System | 14.2.12.1.70 | 2.7.5.2 |
| RCS Leak Rate | 14.2.12.1.71 | - |
| Loose Parts Monitoring System | 14.2.12.1.72 | (2.4.3) |
| Seismic Monitoring System | 14.2.12.1.73 | - |
| Incore Instrumentation System | 14.2.12.1.74 | (2.5.5) |
| Nuclear Instrumentation System | 14.2.12.1.75 | (2.5.5) |

## Table 14.2-202 (Sheet 4 of 5)

## Comparison of Tier 2 Preoperational Tests with Tier 1 Test Requirements

| Test Description | Tier 2 Section | Tier 1 Section |
|---|---|---|
| Remote Shutdown | 14.2.12.1.76 | 2.5.2 |
| Miscellaneous Leakage Detection System | 14.2.12.1.77 | (2.7.6.8) |
| Process and Effluent Radiological Monitoring System, Area Radiation Monitoring System and Airborne Radioactivity Monitoring System | 14.2.12.1.78 | (2.5.5), (2.7.6.6), (2.7.6.13) |
| High-Efficiency Particulate Air Filters and Charcoal Absorbers | 14.2.12.1.79 | 2.7.5.1, 2.7.5.2 |
| Liquid Waste Management System | 14.2.12.1.80 | 2.7.4.1, 2.7.6.8 |
| Gaseous Waste Management System | 14.2.12.1.81 | 2.7.4.2 |
| Solid Waste Management System | 14.2.12.1.82 | (2.7.4.3) |
| Steam Generator Blowdown System | 14.2.12.1.83 | (2.7.1.10) |
| Sampling System | 14.2.12.1.84 | 2.7.6.7 |
| Spent Fuel Pit Cooling and Purification System (SFPCS) | 14.2.12.1.85 | 2.7.6.3 |
| Fuel Handling System | 14.2.12.1.86 | 2.7.6.4 |
| Component Cooling Water System | 14.2.12.1.87 | 2.7.3.3 |
| Turbine Component Cooling Water System | 14.2.12.1.88 | (2.7.3.4) |
| Secondary Side Chemical Injection System | 14.2.12.1.89 | (2.7.1.12) |
| Fire Protection System | 14.2.12.1.90 | 2.7.6.9 |
| Instrument Air System | 14.2.12.1.91 | (2.7.2) |
| Station Service Air System | 14.2.12.1.92 | (2.7.2) |
| Boron Recycle System | 14.2.12.1.93 | - |
| Offsite Communication System | 14.2.12.1.94 | 2.7.6.10 |
| Inplant Communication System | 14.2.12.1.95 | 2.7.6.10 |
| Safeguard Component Area Heating, Ventilation, and Air Conditioning (HVAC) System | 14.2.12.1.96 | 2.7.5.2 |
| Emergency Feedwater Pump Area HVAC System | 14.2.12.1.97 | 2.7.5.2 |
| Class 1E Electrical Room HVAC System | 14.2.12.1.98 | 2.7.5.2 |
| Auxiliary Building HVAC System | 14.2.12.1.99 | 2.7.5.4 |
| Main Steam/Feedwater Piping Area HVAC System | 14.2.12.1.100 | 2.7.5.4 |
| Main Control Room (MCR) HVAC System (including MCR Habitability) | 14.2.12.1.101 | 2.7.5.1 |
| Non-Class 1E Electrical Room HVAC System | 14.2.12.1.102 | 2.7.5.4 |
| Technical Support Center HVAC System | 14.2.12.1.103 | 2.7.5.4 |

**Table 14.2-202 (Sheet 5 of 5)**

**Comparison of Tier 2 Preoperational Tests with Tier 1 Test Requirements**

| Test Description | Tier 2 Section | Tier 1 Section |
|---|---|---|
| Non-Essential Chilled Water System | 14.2.12.1.104 | (2.7.3.6) |
| Vessel Servicing | 14.2.12.1.105 | 2.7.6.5 |
| Safety-Related Component Area HVAC System | 14.2.12.1.106 | 2.7.5.2 |
| Pressurizer Heater and Spray Capability and Continuous Spray Flow Verification | 14.2.12.1.107 | - |
| Non-Essential Service Water (non-ESW) System | 14.2.12.1.108 | (2.7.3.2) |
| Condensate Storage Facilities System | 14.2.12.1.109 | (2.7.6.11) |
| Turbine Building Area Ventilation System (General Mechanical Area) | 14.2.12.1.110 | (2.7.5.5) |
| Turbine Building Area Ventilation System (Electric Equipment Area) | 14.2.12.1.111 | (2.7.5.5) |

Note: Tier 1 sections in parentheses indicate inspection activities.

## 14.3 INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

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### 14.3.4.7 ITAAC for Plant Systems

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CP COL 14.3(1) Replace the last paragraph in DCD Subsection 14.3.4.7 with the following.

The selection criteria and methodology provided in Section 14.3 of the referenced DCD are utilized as the site-specific selection criteria and methodology for ITAAC for site-specific systems. In general, the ITAAC for site-specific systems are developed to correspond to the interface requirements in Tier 1 of the referenced DCD. For those site-specific systems that do not have a safety function sufficiently significant to meet the selection criteria for ITAAC, the system is identified with the designation “No entry for this system”. ITAAC for the site-specific portion of the plant systems are provided in Part 10 of the Combined License Application (COLA). There are only two site-specific systems, the UHS system and ESWS (portions of the outside scope of the certified design) including the site-specific structures, and the UHS ESWS pump house ventilation system, which are addressed in Part 10 of the COLA.

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### 14.3.4.10 ITAAC for Emergency Planning

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STD COL 14.3(2) Replace the last paragraph in DCD Subsection 14.3.4.10 with the following.

The selection criteria and methodology provided in Section 14.3 of the referenced DCD are utilized as the site-specific selection criteria and methodology for the facility’s emergency planning ITAAC. The ITAAC conform to the guidance in this subsection, as modified to reflect the design and specific emergency planning program requirements. The ITAAC for the facility’s emergency planning are provided in Part 10 of the COLA.

## 14.3.6 Combined License Information

Replace the content of DCD Subsection 14.3.6 with the following.

CP COL 14.3(1) ***14.3(1)*** *ITAAC for plant systems*

*This COL item is addressed in Subsection 14.3.4.7*

STD COL 14.3(2) ***14.3(2)*** *ITAAC for emergency planning*

*This COL item is addressed in Subsection 14.3.4.10.*

***14.3(3)*** *Deleted from the DCD.*

# Appendix 14A

# COMPARISON OF RG 1.68 APPENDIX A VERSUS US-APWR TEST ABSTRACTS

APPENDIX 14A

COMPARISON OF RG 1.68 APPENDIX A VERSUS
US-APWR TEST ABSTRACTS

TABLE OF CONTENTS

LIST OF TABLES

# APPENDIX 14A COMPARISON OF RG 1.68 APPENDIX A VERSUS US-APWR TEST ABSTRACTS

This appendix of the referenced DCD is incorporated by reference with the following departures and/or supplements.

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CP COL (10) Add the following text after the last sentence.

The added test abstracts in the Final Safety Analysis Report (FSAR) are correlated to Regulatory Guide (RG) 1.68 Appendix A in Table 14A-201.

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**Table 14A-201**

**Conformance Matrix of RG 1.68 Appendix A Guidance versus Added Test Abstracts in the FSAR**

| | RG 1.68 Appendix A | Section Number | Typical Test |
|---|---|---|---|
| CP COL(10) | 1.h.(7) | 14.2.12.1.114 | UHS ESW Pump House Ventilation System Preoperational Test |
| CP COL(10) | 1.h.(10) | 14.2.12.1.113 | Ultimate Heat Sink (UHS) Preoperational Test |
| STD COL(10) | 1.k.(2) | 14.2.12.1.112 | Personnel Monitors and Radiation Survey Instruments |
| CP COL(10) | 1.n.(14) (a) | 14.2.12.1.114 | UHS ESW Pump House Ventilation System Preoperational Test |

CP COL 14.2(2)

CP COL 14.2(3)

CP COL 14.2(4)

CP COL 14.2(5)

CP COL 14.2(6)

# Appendix 14AA TEST PROGRAM DESCRIPTION

APPENDIX 14AA

TEST PROGRAM DESCRIPTION

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

# APPENDIX 14AA TEST PROGRAM DESCRIPTION

## 14AA.1 PURPOSE

The purpose of this appendix is to provide an outline of the administrative control program used to develop and administer the ITP as defined by Section 14.2. This appendix supplements the program description in Section 14.2. The general terms the “startup organization” or “startup program” used in Section 14.2 are described as the test organization and test program, respectively, in this appendix.

## 14AA.2 SCOPE

This appendix describes the organizational structure of the test organization and organizational interfaces with the plant operating organization, construction organization, engineering design organization, and vendors during turnover from construction, construction installation testing, preoperational testing, and startup testing.

This appendix provides a description of the processes and controls employed for development of ITP test specifications and test procedures, test procedure performance, test results report development, test results acceptance, and test closeout. A description of the joint test group and test review group charters and membership is included. The milestone for the implementation of the ITP is shown in Table 13.4-201.

## 14AA.3 ORGANIZATION AND RESPONSIBILITIES

This section presents a description of the basic functional and programmatic responsibilities of organizations involved with the ITP. The final organizations, position titles, and responsibilities will be defined in the test administrative manual.

### 14AA.3.1 Construction

The construction organization, hereafter referred to as Construction, is responsible for installation and fabrication of the plant, performance of construction acceptance tests, and the preparation of structures, systems, and components (SSCs) for turnover to the test organization. Construction provides support to the test organization during construction installation testing, preoperational and acceptance testing, and startup testing.

### 14AA.3.2 Testing

The test organization, hereafter referred to as Testing, is responsible for the construction turnover process, construction installation testing, preoperational and acceptance testing, and startup testing.

The Test Manager reports to the Plant Manager and has the overall responsibility for administration of the test program, scheduling test evolutions, and staffing the test organization. The Test Manager coordinates testing activities with support organizations including plant staff, engineering, licensing, construction, and equipment vendors.

The Construction Installation Test Manager reports to the Test Manager. The construction installation testing group is responsible for scheduling and managing the construction turnover process and timely completion of construction installation tests to ensure system readiness for preoperational and acceptance testing.

The Preoperational and Acceptance Test Manager reports to the Test Manager. The preoperational and acceptance test group is responsible for scheduling and managing preoperational and acceptance test procedure preparation, performance and closure activities. The Preoperational and Acceptance Test Manager is a member of the joint test group.

The Startup Manager reports to the Test Manager. The startup group is responsible for scheduling and managing startup test procedure preparation, performance, and closure activities for fuel load, initial criticality, low power testing, and power ascension testing. The Startup Manager is a member of the test review group.

The Test Program Manager reports to the Test Manager and is responsible for maintaining the test administrative manual, test personnel certification and qualification, and oversight of the test program administration.

Test Engineers report to their respective test group manager and are responsible for the preparation, performance and closure of test procedures.

### 14AA.3.3 Plant Staff

The organizational structure and responsibilities of the plant staff are described in Section 13.1. Specific responsibilities of plant staff organizations during the ITP are described below.

The Plant Manager is responsible for providing direction and guidance to the Test Manager and overall coordination of test support during the ITP. The Plant Manager provides the final approval of startup test procedures and startup test results and authorizes proceeding to higher power levels following completion of major power plateau testing.

The Director, Operations, and the Operations Department, hereafter referred to as Operations, are responsible for the coordination of operator support with the test organization during the ITP.

The Director, Maintenance, and the Maintenance Department, hereafter referred to as Maintenance, are responsible for performing preventative and corrective

maintenance on mechanical and electric equipment, instrumentation and controls following completion of construction installation testing.

The Nuclear Training Manager is responsible for directing the nuclear training programs for test personnel in order to provide personnel with the requisite skills and knowledge for effectively performing ITP test activities.

### 14AA.3.4 Joint Test Group

The joint test group is comprised of certain station supervisory and technical personnel and is charged with reviewing preoperational test activities and oversight of the construction installation testing process. The joint test group advises the Test Manager on the disposition of those items reviewed.

The primary function of the joint test group is the review and approval of preoperational test procedures, procedure revisions, and test results. The joint test group includes managers, supervisors, or technical representatives from the organizations listed below.

- Testing
- Operations
- Nuclear Engineering and Support
- Mitsubishi Heavy Industries, Ltd. (MHI) and/or Mitsubishi Nuclear Energy Systems, Inc. (MNES) (for preoperational testing performed on the nuclear steam support system and associated auxiliary systems)
- Quality Assurance

The members and their alternates, including the chairman, are designated in writing by the appropriate level of cognizant management.

In addition to the above, representatives of other organizations participate as requested by the chairman.

### 14AA.3.5 Test Review Group

The test review group is comprised of certain station supervisory and technical personnel. The test review group functions as a subcommittee of the Station Operations Review Committee for initial startup testing matters. The test review group is charged with reviewing initial startup test activities and advising the operations review committee on the disposition of those items reviewed. The operations review committee may perform the test review group functions in lieu of the test review group. The primary function of the test review group is the review and approval of initial startup program test procedures, procedure revisions, and test results.

The test review group includes managers, supervisors, or technical representatives from the organizations listed below:

- Testing
- Operations
- Nuclear Engineering and Support
- MHI and/or MNES
- Quality Assurance

The members and their alternates, including the chairman, are designated in writing by the Plant Manager and appropriate level of cognizant management.

In addition to the above, representatives of other organizations participate as requested by the chairman.

## 14AA.4 TEST PROGRAM

### 14AA.4.1 Construction Installation Tests

During plant installation and erection, Construction performs construction acceptance tests to verify proper installation and code compliance. These tests include hydrostatic tests, HVAC integrity tests, and cable integrity tests. Some of these tests also satisfy the test requirement identified in ITAAC such as hydrostatic, pressure integrity and preoperational nondestructive examination (NDE) requirements.

Performance of construction installation tests are controlled and directed by Testing. This phase of testing includes verification that the plant is configured in accordance with the design by piping walkdowns, equipment verifications, and electrical scheme checks. Component-level testing is performed on plant equipment to verify functionality and controls interface, including initial energization of electrical distribution systems, motor rotation verification, instrument calibrations, control device setups, and proper functionality. System cleanliness is established through flushing, air blows, and steam blows, etc. and verified to meet RG 1.37 cleanliness criteria. The guidance provided in RG 1.68 Appendix C, Section 1.a is considered in development of construction installation test requirements.

Construction installation testing is performed using approved procedures based on equipment provider specifications, installation/setup manuals, applicable industry standards, engineering design, and system operating requirements. Procedures are developed for specific equipment types or repetitive activities, where possible, and used to perform testing on multiple components, with each usage documented independently.

The performance of these tests is controlled by Testing. The results of these tests are reviewed and approved by the Construction Installation Test Manager or designee. Construction installation tests which satisfy ITAAC requirements are identified.

Specification of required construction installation tests is identified for each system and tracked to completion as prerequisites for preoperational tests.

This process is defined and procedurally controlled in the test administrative manual, including controls for the preparation, review, approval, closeout, and records retention of construction installation test procedures.

### 14AA.4.2 Acceptance Testing Program

System-level and integrated testing performed on systems or components that are outside of the scope of the ITP and, therefore, not controlled as preoperational or startup tests are identified as acceptance tests. Although outside of the scope of the ITP as defined in Section 14.2, these tests are prepared and performed by Testing with appropriate level of reviews and approvals.

This process is defined and procedurally controlled in the test administrative manual, including controls for the preparation, review, approval, closeout, and records retention of test procedures. Acceptance test activities which satisfy ITAAC requirements are identified.

### 14AA.4.3 Test Administrative Manual

The test administrative manual consists of administrative procedures that implement the requirements specified in Section 14.2 and this appendix. The test administrative manual includes procedures for the following:

- Test program administration (provides a description of the test organization, roles, and responsibilities of its members, applicability of the test program and interfacing organizations and responsibilities)
- Joint test group and test review group review committees (charter, membership, and responsibilities)
- Construction turnover process
- Preparation, review, and approval of construction installation test procedures
- Preparation, review, and approval of preoperational, acceptance and startup test procedures
- Conduct of testing, including test log entries, pre-test briefings, test change requests, test deficiency reports, and retests
- Test closure process, including test data packages, test results reports, test open items, and records preparation
- Control of post-modification and post-maintenance testing
- Test engineer and supervisor certification and qualification

## 14AA.5 JURISDICTIONAL CONTROLS

### 14AA.5.1 Turnover from Construction to Testing

Transfer of jurisdictional control of the plant occurs in a phased approach as the installation, and construction acceptance tests, of plant equipment, systems, subsystems or areas are completed by Construction. The transfer of jurisdictional control from Construction to Testing, known as construction turnover, is a formal process utilizing turnover scoping drawings to define turnover scope and boundaries. Turnover readiness is verified by Testing through walkdowns, punchlisting, and review of construction records.

During the turnover process, systems and components are reviewed for completeness, installation damage, and conformance with appropriate installation and/or design documents. Outstanding construction document and test deficiencies are identified and controlled prior to fuel load. Hydrostatic, pressure integrity and preoperational NDE testing which satisfies ITAAC requirements are identified.

Administrative control of the construction turnover process and formal acceptance of turnovers is controlled by Testing.

This process includes administrative controls to transfer jurisdictional control back to construction for rework or modifications. Upon completion of construction work, the impacts of work performed on completed testing, or additional testing required due to modifications, are identified, and tracked to completion.

This process is defined and procedurally controlled in the test administrative manual.

### 14AA.5.2 Turnover from Test Organization to Operations

Jurisdictional control is transferred to Operations upon the acceptance of preoperational or acceptance testing. Preoperational test activities which satisfy ITAAC test requirements must be completed prior to transfer of jurisdictional control to the plant operating staff. This process is defined and procedurally controlled in the test administrative manual.

## 14AA.6 WORK CONTROLS

Plant administrative procedures establish controls for the issuance of work permits, tracking of work permits to completion and maintaining plant status control during all phases of the ITP.

Testing will review, authorize field performance, and review the results of all field work on SSCs turned over from construction to ensure impacts on testing and plant conditions are carefully monitored and controlled and the as-tested status of SSCs is maintained.

Configuration control of SSCs turned over to Testing is established and maintained following turnover during all phases of testing and maintenance.

## 14AA.7 TEST SPECIFICATIONS

Test specifications provide the technical requirements and acceptance criteria that are to be incorporated into the preoperational and startup test procedures. Upon approval, they are issued as controlled documents. Approved test specifications are required to be available during the preparation and review of preoperational and startup test procedures.

In addition to the requirements in this section, test specifications affecting the safety-related and non-safety related SSCs within the scope of the reliability assurance program are prepared and reviewed in accordance with Subsection 17.4.4.

The preparation, review, and approval of test specifications is defined and procedurally controlled by the engineering design organization responsible for the system or systems.

### 14AA.7.1 Preparation of Test Specifications

Test specifications are prepared by the engineering design organization responsible for the system or systems(s).

Test specifications include the following:

- Test objectives
- Test prerequisites
- Initial conditions and plant configuration during testing
- Special considerations to be addressed during preparation or performance of testing
- Acceptance criteria
- Test methods
- Data collection requirements
- Test results evaluation methods (as applicable)
- Test restoration requirements (as applicable)

## 14AA.8 TEST PROCEDURES

The preparation, review, approval, performance of test procedures is defined and procedurally controlled in the test administrative manual.

In addition to the requirements in this section, test procedures affecting the safety-related and nonsafety-related SSCs within the scope of the reliability assurance program are prepared and reviewed in accordance with Subsection 17.4.4.

### 14AA.8.1 Preparation of Test Procedures

Test procedures are prepared based on formats specified by the test administrative manual, consistent with Subsection 14.2.3.5. These standard formats help ensure that each procedure contains the information and instructions required to satisfactorily perform and document the test. Preoperational test activities which satisfy ITAAC test requirements are identified in the test procedures.

### 14AA.8.2 Review and Approval of Test Procedures

Test procedures are, at a minimum, reviewed by MHI or MNES engineering, Testing, Operations, Quality Assurance, Maintenance, and Licensing.

Preoperational test procedures are reviewed and approved by the joint test group.

Acceptance test procedures are approved by the Test Manager.

Startup test procedures are approved by the test review group and the Plant Manager.

Revisions to test procedures are reviewed and approved by the same organizations and committees that initially approved the document.

Preoperational and startup test procedures are provided to the NRC for review in accordance with Subsection 14.2.3.

## 14AA.9 CONDUCT OF TESTING

The test administrative manual includes controls for the performance of test procedures.

### 14AA.9.1 Configuration Controls

Configuration controls within test procedures provide for documenting the installation and removal of test jumpers, lifted leads, test equipment and off-normal system configurations and ensure restoration to a prescribed configuration at the conclusion of the test.

### 14AA.9.2 Test Coordination

Testing is responsible for coordination of testing activities, including the completion of test prerequisites, assessment of the potential impacts of simultaneous tests on multiple systems, test boundaries, and off-normal conditions during testing.

The test administrative manual includes controls relating to the methods used for initial review of individual parts of multiple tests (e.g., hot functional testing) in order to assure coordination of plant conditions related to these tests.

### 14AA.9.3 Procedure Control

Only one official test copy will be issued for use in the field. Test change requests are immediately incorporated into the official test copy.

### 14AA.9.4 Procedure Changes

Changes that are required to test procedures during test performance are documented on a test change request form. Major changes which affect the intent of the test or affect test acceptance criteria are reviewed and approved by the original approvers of the procedure. Changes not classified as major are reviewed and approved by the cognizant test supervisor. Changes are incorporated into the official test copy prior to the resumption of testing. Test change requests are numbered uniquely, logged, and maintained with the working copy of the test.

### 14AA.9.5 Procedure performance

The test administrative manual includes controls for documenting completion of prerequisites, pre-test briefings, test interruptions and restarts, retesting, documenting of test discrepancies, continuation of testing following discovery of test discrepancies, shift turnovers, and required entries into test logs.

### 14AA.9.6 Test Discrepancies

Test discrepancies are documented on test discrepancy reports, which include a statement of the discrepancy, recommended, and completed corrective actions, retesting requirements and results. Approval requirements for continuation of testing, corrective actions, and closure are specified in the test administrative manual. Test discrepancies are noted at the appropriate test step, logged, and tracked to closure within the Official Test Copy of the test procedure.

## 14AA.10 TEST RESULTS

Following each major phase of the test program, test results and/or test status are reviewed to ensure that required tests have been performed and that the test results have been evaluated.

This evaluation ensures that required systems are operating properly and that testing for the next major phase can be conducted in a safe and efficient manner. This type of review is performed to the extent required before major test phases such as fuel load, initial criticality, and power escalation. During the power escalation phase, review and evaluation of startup test procedure results is completed for each major power plateau prior to proceeding with power ascension testing to the next plateau.

### 14AA.10.1 Review and Approval of Test Results Reports

Following completion of a particular test, a test engineer assembles the test data package for evaluation. A test results report is prepared and included in the test data package. The test results report summarizes the scope and objectives of the test, test deficiencies and their resolution, test changes or revisions, and test acceptance criteria and results showing that each criterion was satisfied.

Construction installation tests do not require test results reports. Results are reviewed and approved by the cognizant test supervisor (approval of results for ITAAC closure is performed under a separate program).

Acceptance test results are reviewed by the Nuclear Engineering and Support organization and approved by the Preoperational and Acceptance Test Manager (approval of results for ITAAC closure is performed under a separate program).

Preoperational test results are reviewed and approved by appropriate members of the joint test group (approval of results for ITAAC closure is performed under a separate program).

Startup test results are reviewed and approved by appropriate members of the test review group.

Each test data package is reviewed to ensure that the test has been performed in accordance with the written approved procedure and that required data, checks, and signatures have been properly recorded and that system performance meets the approved acceptance criteria.

Completed preoperational test activities which satisfy ITAAC test requirements are identified for ITAAC closure documentation.

Deficiencies identified in the review process are resolved to the satisfaction of the appropriate review group. If the evaluation indicates that deficiencies in the test method are responsible for unsatisfactory test results, the test procedure is modified accordingly before retesting is initiated. Whenever an evaluation of test results indicates deficiencies in system performance, the problem is referred to the appropriate engineering organization for evaluation.

The responsibility for final approval of preoperational test results rests with the Test Manager.

The responsibility for final approval of initial startup test results and authorization to proceed to higher power level following completion of major power plateau testing (i.e., 0-5 percent, 50 percent and 75 percent) rests with the Plant Manager.

This process is defined and procedurally controlled in the test administrative manual.

### 14AA.10.2 Open Deficiencies

Unresolved test deficiencies, open items requiring testing, or deficiencies identified with test methods or conduct that are identified during the test procedure closure process shall be identified as test open items.

The resolution of test open items shall be reviewed and approved by the joint test group for preoperational tests and the test review group for startup tests.

This process is defined and procedurally controlled in the test administrative manual.

### 14AA.10.3 Test Closure and Test Records

Completed test packages are assembled for submittal as life-of-plant records in accordance with Subsection 14.2.6. The assembled test package includes:

- The completed test procedure with all attachments, data sheets, test logs, test deficiency reports, and test change requests
- Data collection records
- Test specifications referenced by the procedure
- Approved test results report

This process is defined and procedurally controlled in the test administrative manual.

## 14AA.11 CERTIFICATION AND QUALIFICATION OF TEST PERSONNEL

### 14AA.11.1 Test Engineer Certification and Qualification

Test engineer qualification is accomplished within the framework of the QAPD described in Chapter 17. Records shall be maintained providing evidence of education, experience, plant-specific training, and level of certification.

### 14AA.11.2 Training

Test engineers, supervisors and managers are indoctrinated in the use of applicable administrative procedures, test procedures and familiarized with applicable quality assurance requirements.

Test engineers, supervisors, and managers complete systems training to provide familiarization with system and component operations unique to the design of pressurized-water reactor (PWR) nuclear power plants.

### 14AA.11.3 Supervisory Qualifications

Personnel who are responsible for the review and approval of preoperational or initial startup test procedures and results, and who direct or supervise the conduct of preoperational or initial startup tests shall meet the qualification and training requirements of RG 1.8 Revision 3, May 2000. Qualification of supervisors and managers is accomplished within the framework of the QAPD described in Chapter 17.