14.2 Specific Information to be Included in Final Safety Analysis Reports

The information in this section of the reference ABWR DCD, including all subsections, tables, and figures, is incorporated by reference with the following departures and supplements.

STD DEP T1 2.4-3

STD DEP T1 2.14-1

STD DEP T1 3.4-1

STD DEP 8.3-1

STD DEP 9.1-1

STD DEP 11.2-1

STD DEP 11.4-1

STD DEP 14.2-1 (Table 14.2-1)

STD DEP Admin

14.2.2.1 Normal Plant Staff

The following supplement augments that provided by this subsection.

Normal plant staff responsibilities, authorities, and qualifications are ~~outside the scope of the ABWR Standard Plant and will be provided by the COL applicant, as~~ discussed in ~~Chapter~~ Section *13*.1. *During the construction cycle and the various testing phases, additional staff is supplied by the plant owner/operator, GE, and others.* The plant staff is involved in the initial plant test program in several capacities; including the review of preoperational and startup test procedures and results, performing as startup engineers and other direct participation in test activites. Plant staff will assume increasing responsibility for performing preventative and selected corrective maintanance activities on plant components when released from construction to the Startup Organization. Plant staff will be assigned to assist startup test engineers in performing tests and in operating permanent plant equipment which has been released from construction to the Startup Organization. Plant Operations directs the fuel loading and is responsible for the operation of the plant during initial startup testing. The duties and responsibilities of key plant staff are described in Section 3.2 of NEDO-33305, “Advanced Boiling Water Reactor (ABWR) Startup Administrative Manual,” dated February 22, 2007.

14.2.11 Test Program Schedule

The following supplement addresses the COL License Information Item contained within the text of this subsection.

The schedule, relative to the initial fuel load date, for conducting each major phase of the initial test program, including the timetable for generation, review and approval of procedures, testing and analysis of results will be provided to the NRC 6 months prior to commencement of the initial test program. (COM 14.2-1)

14.2.12 Individual Test Descriptions

14.2.12.1.2 Reactor Recirculation System Preoperational Test

The following supplement augments that provided by this subsection.

NEDO-33316, “Advanced Boiling Water Reactor (ABWR) Vibration Assessment Program in compliance with The United States Nuclear Regulatory Commission Regulatory Guide 1.20,” dated April 2007, identifies the testing/inspection requirements for verifying reactor vessel internals flow-induced vibration is within limits.

14.2.12.1.9 Reactor Core Isolation Cooling System Preoperational Test

STD DEP T1 2.4-3

(2) General Test Methods and Acceptance Criteria

The RCIC turbine shall be tested in accordance with the manufacturer’s recommendations. ~~Usually this involves the turbine first being tested while disconnected from and then while coupled to the pump.~~

~~(f) Proper operation of the barometric condenser condensate pump and vacuum pump.~~

14.2.12.1.12 ~~*Multiplexing System*~~ Data Communication Function Preoperational Test

STD DEP T1 3.4-1

(1) Purpose

To verify proper functioning of the plant ~~multiplexing system~~ data communications*, including both essential and nonessential ~~(EMS and NEMS) subsystems~~* functions*.*

(2) Prerequisites

The construction test have been successfully completed, and the SCG has reviewed the test procedure and approved the initiation of testing. The power supply, ~~logic units (SSLC),~~ and other components ~~(MCU, RMU, CMU)~~

associated with the ~~essential and non-essential multiplexing systems~~ data communications function *shall be operable. The interfacing systems' actuators, alarms, and displays which receive the processed control signals ~~from the essential and non-essential multiplexing systems~~ shall be operational. The data acquisition and communication software required to support the ~~essential and non-essential multiplexing system~~ functions shall be available.*

(3) General Test Method and Acceptance Criteria

Since this ~~system~~ function provides the *~~is the primary~~ communication interface between the various plant systems, it shall be adequately tested during the preoperational phase testing performed on those interconnected systems. The integrated hardware/software testing shall check the system functional performance and interface requirements as specified in ~~the non-essential multiplexing system (NEMS) and essential multiplexing system (EMS)~~ design specifications. The verification and validation (V&V) tests are performed to check the input signal coming from appropriately assigned input point and the output signal to the appropriately assigned signal points. This testing shall also check the ~~function of the redundant multiplexing system and the fail-safe function of both systems. The~~ capability of both warm and cold starts upon power interruption and automatic self-test function of the systems shall also be demonstrated to meet the design requirements. ~~Additionally, after the above verification, the validated essential multiplexing system shall be checked for final validation during integrated EMS/SSLC testing as part of the SSLC preoperational test (Subsection).~~ Testing shall include confirmation of every ~~multiplexed~~ sensor signal for accuracy, and functional requirements of control, interlock or display as specified in the documents of the system integrated within the SSLC.*

14.2.12.1.45.4 Electrical Power Distribution System Preoperational Test

STD DEP 8.3-1

STD DEP ADM

(2) Prerequisites

The construction tests for the individual component associated with the EPDS have been successfully completed, and the Startup Coordination Group *(SCG) has reviewed the test procedure and approved the initiation of testing. All the necessary permanently installed and test instrumentation shall have been properly calibrated and operational. Appropriate electrical power sources shall be available for remote control, parameter information and annunciators associated with the electrical power distribution system. Adequate ventilation to both switchgear and battery rooms shall be available and operational. The portion of Fire Protection System covering the EPDS areas shall be available for use. Additionally, the plant EPDS (27 kV, ~~6.9 kV,~~*

13.8 kV, 4.16kV, *480V, ~~and~~ 120 VAC, and 125 VDC power) shall be installed prior to this test.*

14.2.12.1.50 Fuel-Handling and Reactor Component Servicing Equipment Preoperational Test

STD DEP 9.1-1

(3) General Test Methods and Acceptance Criteria

Fuel-handling and reactor component servicing equipment testing described herein includes that of the reactor building crane, refueling machine *~~bridge~~, auxiliary platform, and the associated hoists and grapples, as well as other lifting and rigging devices.*

Performance shall be observed and recorded during a series of individual component and integrated system tests. These tests shall demonstrate that the system operates properly as described in Subsection 9.1.4 during following testing:

(d) Proper assembly and operation of reactor vessel servicing equipment, including reactor vessel servicing tools, main steamline plugs, shroud head stud wrench, head holding pedestal, *~~RPV head tensioning and detensioning,~~* dryer/separator strongback, and RPV head strongback carousel and stud tensioning system.

(f) Dynamic and static load testing of all cranes, hoists, and associated lifting and rigging equipment, including static load testing at 125% of rated load and full operational testing at 100% of rated load. Heavy load strongbacks will be tested to ANSI 14.6 requirements.

(h) Proper installation and operation of fuel servicing equipment, such as fuel preparation machine, new fuel inspection stand, channel bolt wrenches and handling tools,and general-purpose grapples*~~ and fuel pool vacuum sipper~~*.

(i) Correct installation and operation of under-reactor vessel servicing equipment, including FMCRD servicing tools and handling equipment, incore *~~flange seal test plug~~* sealing equipment, and RIP handling equipment.

14.2.12.1.52 Reactor Vessel Flow-Induced Vibration Preoperational Test

The following supplement augments that provided by this subsection.

NEDO-33316, “Advanced Boiling Water Reactor (ABWR) Vibration Assessment Program in compliance with The United States Nuclear Regulatory Commission Regulatory Guide 1.20,” dated April 2007 provides references to the comprehensive vibration assessment test results for the ABWR Valid Prototype reactor. The LTR provides the basis for classifying STP 3 & 4 as having “Non-Prototype, Category I”

reactor internals of the Valid Prototype Standard 1350 MWe Plant. For Non-Prototype, Category I ABWR units, the vibration assessment program consists of (1) a vibration analysis program and (2) an inspection program prior to and following the pre-operational tests. This program complies with Regulatory Guide 1.20.

14.2.12.1.55 Reactor Water Chemistry Control Systems Preoperational Test

The following supplement augments that provided by this subsection.

Testing for systems that will not be placed in service during the initial operating cycle may be deferred.

14.2.12.1.70 Main Turbine and Auxiliaries Preoperational Test

STD DEP Admin

(2) Prerequisites

To the extent practicable, a ~~temporary~~ steam supply shall be available to apply to the main turbine~~ and reactor feed pump seals~~.

14.2.12.1.72 Flammability Control System Preoperational Test

STD DEP T1 2.14-1

NEDE-33330P, "Advanced Boiling Water Reactor (ABWR) Hydrogen Recombiner Requirements Elimination," dated May 2007 describes the elimination of the hydrogen recombiners from the certified design. The markup information on pages C-100 and C-101 of NEDE-33330P is incorporated by reference.

14.2.12.1.75 Liquid and Solid Radwaste Systems Preoperational Tests

STD DEP 11.2-1

STP DEP 11.4-1

STD DEP Admin

(3) General Test Methods and Acceptance Criteria

(b) Proper operation of equipment protective features and automatic isolation functions, including those for ventilation systems and liquid effluent pathways (as applicable).

(g) Acceptable functions of the ~~thin film dryer, pelletizer, pellet filling machine, mixing tank, drum conveyor and incinerator during integrated~~

solid radwaste system ~~operation in solidifying, packaging, compacting, and incinerating processes,~~ as specified by Subsection 11.4.

(h) Proper operation of filter ~~and demineralizer regeneration~~ cycles of the liquid radwaste system and their associated support facilities.

(j) Capability of the solid radwaste system to receive, process and transfer waste ~~between designated locations using simulated waste variation~~ in accordance with the Process Control Program (PCP).

(k) Proper operation of the automatic isolation function of ~~radwaste system~~ containment isolation valves upon receipt of a simulated containment isolation initiation signal.

14.2.12.1.77 Ultimate Heat Sink Preoperational Test

The conceptual design information in this subsection of the reference ABWR DCD is replaced with the following site-specific supplemental information.

(2) Prerequisites

The construction tests have been successfully completed, and the SCG has reviewed the test procedure and approved the initiation of testing. All instrumentation and devices associated with the UHS has been properly calibrated. The HVAC System within ~~spray pond~~ the RSW pump house ~~structure~~ is operational and available. The Reactor Service Water System is operational and available for all anticipated modes of RSW System operation. Sufficient quantity of water ~~are~~ is available in the ~~spray pond~~ UHS basin for use. All of the required interfacing systems shall be available, as needed, to support the specified testing.

(3) General Test Methods and Acceptance Criteria

(b) Proper operating conditions and performance capability of the UHS cooling tower spray networks during all anticipated modes of the RSW System operations as specified in Subsection 9.2.5.4.1.

(d) Proper operation of the makeup water valve to maintain proper water level in the UHS ~~spray pond~~ basin through makeup line and maintain water quality in conjunction with the blowdown operation as specified in Subsection 9.2.5.3.4.

(e) Proper operation of blowdown from the UHS ~~spray pond~~ basin to remove excess water and maintain water quality control through the blowdown line as specified in Subsection 9.2.5.3.4.

14.2.12.2.5 Control Rod Drive System Performance

STD DEP 14.2-1

(3) Description

In addition, the drive-line friction will be measured in terms of the pressure under hollow piston for each CRD at cold conditions (if not previously done during preoperational test phase)~~ and again verified on four selected CRDs at rated temperature and pressure conditions during initial heatup of the startup test program~~.

14.2.12.2.12 Reactor Internals Vibration

The following supplement augments that provided by this subsection.

NEDO-33316, "Advanced Boiling Water Reactor (ABWR) Vibration Assessment Program in Compliance with The United States Nuclear Regulatory Commission Regulatory Guide 1.20," dated April 2007 provides references to the comprehensive vibration assessment test results, for the ABWR Valid Prototype Reactor. The LTR provides the basis for classifying STP 3 & 4 as having "Non-Prototype, Category I" reactor internals of the Valid Prototype Standard 1350 MWe Plant. For Non-Prototype, Category I ABWR units, the vibration assessment program consists of (1) a vibration analysis program and (2) an inspection program prior to and following the pre-operational tests. This program complies with Regulatory Guide 1.20.

14.2.12.2.22 RCIC System Performance

STD DEP T1 2.4-3

(1) Description

The RCIC System will be tested in two ways, through a full flow test line leading to the suppression pool and by flow injection directly into the reactor vessel. The first set of tests will consist of manual and automatic mode starts and steady-state operation at 1.03 MPaG and near rated reactor pressure conditions, in the full flow test mode. During these tests, an attempt will be made to throttle pump discharge pressure in order to simulate reactor pressure and the expected pipeline pressure drop. This testing is done to demonstrate general system operability. After the operability demonstration, the RCIC ~~turbine speed~~ control loop will be adjusted at near rated reactor pressure conditions. Reactor vessel injection tests at near rated reactor pressure will follow to complete the controller adjustments, as necessary, and to demonstrate automatic starting from hot standby condition. Subsequently, a reactor vessel injection demonstration at 1.03 MPaG reactor pressure, including an automatic mode start and stability demonstration, shall be conducted to verify satisfactory system performance under the final set of optimized controller settings. ~~Proper controller adjustment is verified by introducing small step disturbances in speed and flow demand and then demonstrating satisfactory system response at both low RCIC pump flow (but~~

~~*above minimum turbine speed) and near rated RCIC pump flow conditions, in order to span the RCIC operating range.*~~

(2) Criteria

Level 2

~~*The RCIC turbine speed and pump flow control loops shall be adjusted so that the RCIC System flow related variable responses to test inputs are at least quarter damped (i.e., the decay ratio of the second to first overshoot of each variable is less than or equal to 0.25) as stated in the applicable RCIC System Design Specification.*~~

~~*The RCIC Turbine Gland Seal System shall be capable of preventing significant steam leakage to the atmosphere.*~~

For automatic start tests, in order to provide margins to overspeed and isolation trip setting, the transient start first and subsequent turbine speed peaks shall not exceed the requirement specified by the GE Startup Test Specifications.

The RCIC Turbine Steam Supply line high flow isolation trip shall be calibrated to actuate at the value specified in the plant Technical Specifications.

14.2.13 COL License Information

14.2.13.1 Other Testing

The following site-specific supplement addresses COL License Information Item 14.1.

FSAR Section 14.2S provides the additional testing requirements for the following systems.

(1) Electrical switchyard and equipment

(2) Personnel monitors and radiation survey instruments

(3) Site security equipment

There is no automatic dispatcher control system for STP 3 & 4.

14.2.13.2 Test Procedures/Startup Administrative Manual

The following site-specific supplement addresses COL License Information Item 14.2.

NEDO-33305, “Advanced Boiling Water Reactor (ABWR) Startup Administrative Manual” dated February 2007 delineates the processes that will be used to administer the Initial Test Program at STP 3 & 4. These processes include:

- Conduct of the test program (Subsection 14.2.4)

- Review, evaluation, and approval of test results
- Methods for controlling pre-fuel load checks, initial fuel loading, pre-critical testing and initial criticality
- Test program schedule
- Determinations of operability and availability of interfacing support systems requirements

NEDO-33310, “Advanced Boiling Water Reactor (ABWR) Startup Test Specification” dated April 2007 provides guidance for sequencing testing during the Startup Test Phase.

This scoping document contains the following elements for the Startup Test Phase of the Initial Test program:

- Testing objectives and acceptance criteria
- Plant operational conditions at which tests are to be conducted, testing methodologies to be utilized, specific data to be collected, and acceptable data reduction techniques.
- Reconciliation methods needed to account for test conditions, methods or results if testing is performed at conditions other than representative design operating conditions

Site-specific Preoperational and Startup Test Specifications, containing testing objectives and acceptance criteria, will be provided to the NRC at least 6 months prior to the start of the Initial Test Program. (COM 14.2-2) These scoping documents will delineate:

- Plant operational conditions at which tests are to be conducted, testing methodologies to be utilized, specific data to be collected, and acceptable data reduction techniques.
- Reconciliation methods needed to account for test conditions, methods or results if testing is performed at conditions other than representative design operating conditions.

Approved preoperational test procedures will be available for NRC review approximately 60 days prior to their intended use but no later than 60 days prior to fuel loading (Subsection 14.2.3). (COM 14.2-3)

Approved startup test procedures will be available for NRC review approximately 60 days prior to fuel loading (Subsection 14.2.3). (COM 14.2-4)

Table 14.2-1 Startup Test Matrix

Power Ascension Test	Testing Plateau					Notes
	OV	HU	LP	MP	HP	
Control Rod Drive System Performance:						
Friction Testing	✔	~~✔~~				~~HU - 4 selected rods at rated pressure~~