

**From:** Amy Cubbage  
**To:** Hinds, David H (GE Energy)  
**Date:** 5/24/2006 10:13:04 PM  
**Subject:** Draft RAIs DCD 14.2 (Initial Test Program)

David,

See attached draft RAIs regarding the initial test program. Please contact Martha Barillas at (301)415-4115 to schedule a telecon to discuss.

Thanks,  
Amy

**CC:** internet:Dan@williamson.net; internet:george.stramback@gene.ge.com;  
internet:joel.friday@ge.com; internet:kathy.sedney@gene.GE.com; internet:wayne.massie@ge.com;  
Kavanagh, Kerri; Milton Concepcion-Robles

**Mail Envelope Properties** (447512B0.931 : 18 : 35420)

**Subject:** Draft RAIs DCD 14.2 (Initial Test Program)  
**Creation Date** 5/24/2006 10:13:04 PM  
**From:** Amy Cubbage

**Created By:** AEC@nrc.gov

**Recipients**

joel

friday CC (internet:joel.friday@ge.com)

wayne

massie CC (internet:wayne.massie@ge.com)

george

stramback CC (internet:george.stramback@gene.ge.com)

kathy

sedney CC (internet:kathy.sedney@gene.GE.com)

williamson.net

Dan CC (internet:Dan@williamson.net)

ge.com

david.hinds (David H (GE Energy) Hinds)

nrc.gov

OWGWPO02.HQGWDO01

KAK CC (Kerri Kavanagh)

nrc.gov

TWGWPO01.HQGWDO01

MCR1 CC (Milton Concepcion-Robles)

**Post Office**

joel

wayne

george

kathy

williamson.net

**Route**

internet:ge.com

internet:ge.com

internet:gene.ge.com

internet:gene.GE.com

internet

ge.com

nrc.gov

nrc.gov

OWGWPO02.HQGWDO01

TWGWPO01.HQGWDO01

**Files**

MESSAGE

Draft RAIs 14.2 05 24 2006.pdf

PM

**Size**

666

**Date & Time**

5/24/2006 10:13:04 PM

50437

5/24/2006 10:07:44

**Options**

**Expiration Date:**

None

**Priority:**

Standard

**ReplyRequested:**

No

**Return Notification:**

None

**Concealed Subject:**

No

**Security:**

Standard

**Draft Requests for Additional Information (RAI)**  
**ESBWR Design Control Document (DCD) Section 14.2 , Initial Test Program**

RAI Number	Reviewer	Question Summary	Full Text
14.2-5	Concepcion M Kavanagh K	Verify redundancy, electrical independence, and testing of the fault tolerant digital controllers will be performed for the FWCS as part of pre-operational testing.	<p>Section 1.j of Regulatory Guide (RG) 1.68 states that the initial test program should include in its pre-operational phase the testing of instrumentation and control systems that (1) control normal operation of the facility, (2) provide information and alarms in the control room to monitor the operation and status of the facility, (3) establish that the facility is operating within design and license limits, (4) permit or support the operation of engineered safety features, and (5) monitor and record important parameters during and following postulated accidents. Also, section 1.j of RG 1.68 includes provisions to verify redundancy and electrical independence of these instrumentation and control systems.</p> <p>Consistent with the above RG:</p> <p>(a) Specify whether the fault tolerant digital controllers will be tested as part of the feedwater control system (FWCS) pre-operational test; and</p> <p>(b) Specify whether the redundancy and electrical independence of the FWCS will be verified as part of the system pre-operational test.</p> <p>If these tests will be performed, provide the appropriate test descriptions in the DCD Tier 2, Section 14.2.8.1.2. Otherwise, provide adequate justification for not performing the tests.</p>

14.2-6	Concepcion M Kavanagh K	Verify testing of heaters and testing for redundancy and electrical independence will be performed for the SLC system as part of the pre-operational testing.	<p>Section 1.b.(3) of RG 1.68 states that the initial test program should include testing of the standby liquid control (SLC) system in its pre-operational phase, including testing to verify redundancy and electrical independence. Also, verification of the operability of heaters used to control the solution temperature is required. The pre-operational test description of the SLC system does not include verification of electrical independence and redundancy for the Class 1E electrical system. Also, testing of the heater installed in the mixing drum is not addressed in the test description.</p> <p>Consistent with the above RG:  (a) Specify whether the redundancy and electrical independence of the SLC system will be verified; and  (b) Specify whether the heater installed in the mixing drum will be tested to verify its proper operation.</p> <p>If these tests will be performed, please provide the appropriate test descriptions in the DCD Tier 2, Section 14.2.8.1.3. Otherwise, provide adequate justification for not performing the tests.</p>
14.2-7	Concepcion M Kavanagh K	Specify whether the correct failure mode on loss of power will be verified as part of the CRD system pre-operational test.	<p>Section 1.b.(1) of RG 1.68 states that the initial test program should include the testing of the control rod drive (CRD) system in its pre-operational phase, including testing to verify the correct failure mode on loss of power. Consistent with the above RG, specify whether the correct failure mode on loss of power will be verified as part of the CRD system pre-operational test.</p> <p>If this test will be performed, please provide the appropriate test description in the DCD Tier 2, Section 14.2.8.1.4. Otherwise, provide adequate justification for not performing the test.</p>

14.2-8	Concepcion M Kavanagh K	Verify calibration, testing, and operability of sensors, and channel response time of the RPS/ESF systems will be performed as part of pre-operational testing.	<p>Section 1.c of RG 1.68 states that the initial test program should include the testing of the reactor protection system and engineered safety feature actuation (RPS/ESF) systems in its pre-operational phase. The pre-operational test description should include the testing of the response time of each of the protection channels, including sensors. The pre-operational test description of the SSLC does not include testing for channel response time or sensor calibration/testing. Consistent with the above RG, specify whether the channel response time and sensor calibration and testing will be performed during the SSLC pre-operational test.</p> <p>If these tests will be performed, provide the appropriate test descriptions in the DCD Tier 2, Section 14.2.8.1.6. Otherwise, provide adequate justification for not performing the test.</p>
14.2-9	Concepcion M Kavanagh K	Verify testing of manual controls for MSIV's, RWCU/SDC, and containment isolation switches will be performed as part of pre-operational testing.	<p>Section 1.j of RG 1.68 states, in part, that the initial test program should include the testing of instrumentation and control systems that permit or support the operation of engineered safety features in its pre-operational phase. The pre-operational test description of the LD&amp;IS does not include testing criteria for the following manual control functions:</p> <ul style="list-style-type: none"> <li>1Actuation of each main steam isolation valve (MSIV) test switch</li> <li>2MSIV isolation switches</li> <li>3MSIV logic reset</li> <li>4Reactor water cleanup (RWCU)/ shutdown cooling (SCD) isolation switch</li> <li>5Containment isolation manual switch</li> <li>6Containment isolation logic reset</li> <li>7Reactor Building HVAC isolation</li> </ul> <p>Consistent with the above RG, specify whether the above manual controls will be tested during the LD&amp;IS pre-operational test.</p> <p>If these tests will be performed, provide the appropriate test descriptions in the DCD Tier 2, Section 14.2.8.1.8. Otherwise, provide adequate justification for not performing the tests.</p>

14.2-10	Concepcion M Kavanagh K	Verify testing of manual controls for systems and equipment included in the RSS will be performed as part of pre-operational testing.	<p>Section 1.j of RG 1.68 states, in part, that the initial test program should include in its pre-operational phase the test of instrumentation and control systems that permit or support the operation of engineered safety features. The test program should include testing of instrumentation and controls used for shutdown from outside the control room. The pre-operational test description of the remote shutdown system (RSS) does not include testing to demonstrate proper operation of individual systems and equipment when operated from the remote shutdown panel. Consistent with the above RG, specify whether the individual systems and equipment included in the remote shutdown panel will be tested during the pre-operational test phase.</p> <p>If this test will be performed, provide the appropriate test description in the DCD Tier 2, Section 14.2.8.1.12. Otherwise, provide adequate justification for not performing the test.</p>
14.2-11	Concepcion M Kavanagh K	Verify testing for redundancy and electrical independence; testing for all modes of operation.	<p>Section 1.m of RG 1.68 states that the initial test program should include the test of the equipment and components used to handle or cool irradiated and non-irradiated fuel in its pre-operational phase. The test description should include verification of redundancy and electrical independence. The pre-operational test description of the fuel and auxiliary pools cooling system (FAPCS) does not include provisions for verifying electrical independence and redundancy. Also, the FAPCS has 8 modes of operation in which different flow paths are necessary to achieve cooling and cleaning capability.</p> <p>Consistent with the above RG:</p> <p>(a) Specify whether the redundancy and electrical independence of the FAPCS will be verified as part of the FAPCS preoperational test; and</p> <p>(b) Specify whether all the FAPCS modes of operation will be tested during the pre-operational phase.</p> <p>If these tests will be performed, provide the appropriate test descriptions in the DCD Tier 2, Section 14.2.8.1.14. Otherwise, provide adequate justification for not performing the tests.</p>

14.2-12	Concepcion M Kavanagh K	Verify testing for redundancy and electrical independence of the ARM will be performed as part of pre-operational testing.	<p>Section 1.k.(1) of RG 1.68 states that the initial test program should include the test of the equipment and components used to monitor or measure radiation levels in its pre-operational phase. The test description should include testing to verify redundancy and electrical independence. The pre-operational test description of the area radiation monitor (ARM) system does not include provisions for verifying electrical independence and redundancy. Consistent with the above RG, specify whether the redundancy and electrical independence of the ARM system will be verified as part of the ARM system pre-operational test.</p> <p>If this test will be performed, provide the appropriate test description in the DCD Tier 2, Section 14.2.8.1.14 . Otherwise, provide adequate justification for not performing the test.</p>
14.2-13	Concepcion M Kavanagh K	Verify testing for redundancy and electrical independence of IA and SA systems. Demonstrate that IA and SA cannot be inadvertently interconnected as part of pre-operational testing.	<p>Section 1.n.(11) of RG 1.68 states that the initial test program should include the test of the compressed gas systems used to support the normal operation of the facility or are essential for the operation of standby safety equipment or engineered safety features in its pre-operational phase. The test program should include verification of redundancy and electrical independence of the compressed gas system. RG 1.68.3, "Preoperational Testing of Instrument and Control Air Systems," provides guidance for conducting pre-operational testing of the instrument and control air systems. Regulatory position 9 of RG 1.68.3 calls for tests to demonstrate that air supplies such as the service air (SA) supply is not inadvertently tied into the instrument air (IA) system.</p> <p>Consistent with the above RG:</p> <p>(a) Specify whether the redundancy and electrical independence of the IA and SA Systems will be verified as part of the system pre-operational test; and</p> <p>(b) Specify whether a demonstration that the IA system and the SA system cannot be inadvertently interconnected will be conducted as part of the Instrument Air and Service Air Systems preoperational test.</p> <p>If these tests will be performed, provide the appropriate test descriptions in the DCD Tier 2, Section 14.2.8.1.19 . Otherwise, provide adequate justification for not performing the tests.</p>

14.2-14	Concepcion M Kavanagh K	Verify testing for redundancy and electrical independence of the RCCWS as part of the pre-operational testing.	Section 1.n.(3) of RG 1.68 states that the initial test program should include the test of the component cooling water systems to demonstrate its operability in its pre-operational phase . The test program should include verification of redundancy and electrical independence of the reactor component cooling water system (RCCWS). Consistent with the above RG, specify whether the redundancy and electrical independence of the RCCWS will be verified as part of the system pre-operational test. If this test will be performed, provide the appropriate test description in the DCD Tier 2, Section 14.2.8.1.21. Otherwise, provide adequate justification for not performing the test.
14.2-15	Concepcion M Kavanagh K	Verify the redundancy and electrical independence of the electrical systems as part of the pre-operational testing.	Section 1.g of RG 1.68 states that the initial test program should include the test of the electrical systems to demonstrate its operability in its pre-operational phase. RG 1.68 states that the test program should include verification of redundancy and electrical independence. The pre-operational test descriptions for the electrical power systems, including the DC power system, the AC power distribution system, and the standby diesel generator and AC power system, do not include provisions for verifying electrical independence and redundancy. If this test will be performed, provide the appropriate test description in the DCD Tier 2, Section 14.2.8.1.35. Otherwise, provide adequate justification for not performing the test.
14.2-16	Concepcion M Kavanagh K	Justify the exemption from testing for the systems in Section 14.2.9.	The staff requests additional information concerning the structures, systems, and components (SSCs), and design features which are candidates for proposed exemptions from operating license conditions requiring NRC prior approval for major test changes. These SSCs and design features are listed in Section 14.2.9 of the ESBWR DCD Tier 2, "COL Information." Provide the basis for exemption of each of the systems listed in Section 14.2.9.



14.2-17	Concepcion M Kavanagh K	Provide justification for exception on tests stated in section 14.2.6.	<p>In DCD Tier 2, Section 14.2.6, the applicant stated the following:            "Fuel loading and initial criticality are conducted in a controlled manner in accordance with specific written procedures as part of the startup test phase (Subsection 14.2.8.2). However, unforeseen circumstances may arise that would prevent the completion of the pre-operational testing (including the review and approval of the test results), but that would not necessarily justify the delay of fuel loading. Under such circumstances, the COL licensee may decide to request permission from the NRC to proceed with fuel loading. If portions of any pre-operational tests are intended to be conducted, or their results approved, after commencement of fuel loading, then the following shall be documented in such a request:</p> <ul style="list-style-type: none"> <li>• List each test;</li> <li>• State which portions of each test are delayed until after fuel loading;</li> <li>• Provide technical justification for delaying these portions; and</li> <li>• State when each test would be completed and the results approved."</li> </ul> <p>RG 1.68 states that pre-operational tests should be completed and the results of such tests evaluated and approved by the applicant prior to issuance of the operating license. Clarify how such exceptions will be acceptable.</p>
14.2-18	Concepcion M Kavanagh K	Proposed COL action item regarding organizational and staffing responsibilities.	Please include a COL action item to provide complete, detailed information regarding the staff responsibilities, authorities, and personnel qualifications for conducting the initial test program in accordance with RG 1.68, to ensure the plant owner/operator provides the necessary information to be reviewed by the NRC staff at the time of the COL application.
14.2-19	Concepcion M Kavanagh K	Proposed COL action item regarding the development, review, and approval of test procedures.	Please include a COL action item to provide complete, detailed information regarding the development, review, and approval of test procedures in accordance with RG 1.68, to ensure the plant owner/operator provides the necessary information to be reviewed by the NRC staff at the time of the COL application.

14.2-20	Concepcion M Kavanagh K	Proposed COL action item regarding the utilization of reactor operating and testing experience.	Please include a COL action item to provide complete, detailed information regarding the utilization of reactor operating and testing experience in accordance with RG 1.68, to ensure the plant owner/operator provides the necessary information to be reviewed by the NRC staff at the time of the COL application.
14.2-21	Concepcion M Kavanagh K	Proposed COL action item regarding the trial use of operating and emergency procedures.	Please include a COL action item to provide complete, detailed information regarding the trial use of operating and emergency procedures in accordance with RG 1.68, to ensure the plant owner/operator provides the necessary information to be reviewed by the NRC staff at the time of the COL application.
14.2-22	Concepcion M Kavanagh K	Proposed COL action item regarding the development of the test program schedule and sequence.	Please include a COL action item to provide complete, detailed information regarding the development of the test program schedule and sequence in accordance with RG 1.68, to ensure the plant owner/operator provides the necessary information to be reviewed by the NRC staff at the time of the COL application.
14.2-23	Concepcion M Kavanagh K	Proposed COL action item regarding the initial startup testing phase.	The specifics of the startup tests relating to test methodology, plant prerequisites, initial conditions, acceptance criteria, and analysis techniques are responsibility of the plant owner/operator. Please include a COL action item to provide complete, detailed information regarding the initial startup testing phase in accordance with RG 1.68, to ensure the plant owner/operator provides the necessary information to be reviewed by the NRC staff at the time of the COL application.