ArevaEPRDCPEm Resource

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Sent: Wednesday, August 18, 2010 2:29 PM
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Subject: Draft - U.S. EPR Design Certification Application RAI No. 439 (4802,4803), FSAR Ch. 14
Attachments: Draft RAI_439_SBPA_4802_4803.doc

Attached please find draft RAI No. 439 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,
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Request for Additional Information No. 439(4802, 4803), Revision 1

8/18/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 14.02 - Initial Plant Test Program - Design Certification and New License Applicants
SRP Section: 14.03.07 - Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria

Application Sections: 14.2 & 14.3

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

14.02-162

SRP Section 14.2, Item 5 under SRP Acceptance Criteria, specifies that applicants should provide abstracts of planned tests to demonstrate and verify the performance capabilities of SSCs and design features that serve functions that are important to safety. The staff found the information in the FSAR to be insufficient in this regard. In particular, additional information is needed to address the following items:

1) Tier 2 Test 14.2.12.7.10 specifies testing for the steam turbine. The staff found that the test description is either incomplete or requires clarification with respect to the following items:

   a. The objectives under Item 1.4 indicate that a reactor trip and low condenser vacuum should each cause the turbine to trip. However, these trips are not listed in Tier 2 Section 10.2. Also, the trips that are listed in Tier 2 Section 10.2 are not included within the scope of the test objectives.

   b. The test needs to confirm that turbine overspeed protection is available and functioning properly; and that the manual turbine trip circuits in the control room and at the turbine are functioning properly and manned before proceeding with the rest of the test.

   c. Item 3.2 verifies the detection and annunciation of dangerous or undesirable conditions, and initiation of the appropriate control response. It is not clear what these conditions are and what the control response should be. The specific conditions of interest should be described in Tier 2 Section 10.2 of the DCD and referred to by the test procedure.

   d. Item 3.5 specifies observation of the response of power-operated valves upon a loss of motive power and refers to Tier 2 Section 10.3 for the anticipated response. The turbine control and stop valves are described in Tier 2 Section 10.2, and it isn't clear why Section 10.3 is being referenced and it isn't really clear what "power operated" valves are being referred to.

   e. Item 4 specifies data that is required, but the data that is called for doesn't seem to correlate very well with the actual testing that is being done. For

example, Item 4.3 calls for the conditions under which the manual trips operate but the test does not specifically call for manual trip operation.

f. Item 5 specifies the test acceptance criteria that must be satisfied, but they don't seem to encompass all of the items referred to under Items 3 and 4 of the test procedure. Also, Item 5.1 refers to Tier 2 Section 10.3 for the performance acceptance criteria for the steam turbine system and support systems but Tier 2 Section 10.2 describes turbine generator performance considerations; and not all of the considerations referred to in Item 5.1 are described in Section 10.2.

g. Items 5.3 and 5.4 refer to Tier 2 Section 10.2 for information about turbine trip initiation in response to a reactor trip and a loss of condenser vacuum, but this information is not discussed in Section 10.2.

h. The test needs to include provisions for addressing extraction steam non-return valve performance.

2) Tier 2 Test 14.2.12.11.11 specifies testing for the turbine generator instrumentation and control system. The staff found that the test description is incomplete or requires clarification with respect to the following items:

a. The prerequisite listed under Item 2.7 specifies verification of proper operation of alarm, control, and indication functions. However, alarm, control, and indication functions need to be described in Tier 2 Section 10.2 and referred to by the test specification.

b. The test method listed in the first sentence under Item 3.3 is a restatement of the test objective and is not really a test method.

c. The trip logic referred to by Item 5.1 under the acceptance criteria needs to be discussed in Tier 2 Section 10.2 and referred to by the test specification.

d. The "normal test functions" referred to under Item 5.5 of the acceptance criteria need to be described in Tier 2 Section 10.2 and referred to by the test specification.

e. The test needs to include provisions to address the fail-safe response of the turbine generator control and overspeed protection systems.

f. Provisions for addressing the turbine generator control and overspeed protection system diagnostic routines need to be included. The diagnostic routines also need to be described in Tier 2 Section 10.2 and referred to by the test specification.

3) Tier 2 Test 14.2.12.13.14 specifies pre-core turbine overspeed trip testing. The staff found that the test description is incomplete or requires clarification with respect to the following items:

a. Provisions need to be included for testing the manual turbine overspeed trip devices located in the control room and at the turbine to confirm that they are fully functional and manned before proceeding with the test.

b. Item 5.1 of the acceptance criteria specifies verification that the primary and secondary turbine trips occur within the design limits and refers to Tier 2 Section 10.2.2.9 for this information. However, the design limits that are

referred to are not included in Tier 2 Section 10.2.2.9 and this information needs to be added to the FSAR accordingly.

c. In addition to confirming that the turbine steam admission valves for the high pressure and intermediate pressure turbines are functioning properly in response to turbine trip signals, provisions need to be included for confirming proper operation of the extraction steam non-return valves that are credited for preventing turbine overspeed.

4) Tier 2 Test 14.2.12.16.5 specifies control systems checkout testing. Items 1.2 and 1.3 under the test objectives are to demonstrate that the automatic control systems operate satisfactorily during steady-state and transient conditions. These test objectives specify that the control systems shall control plant parameters in manner that minimizes oscillations of critical parameters, such as turbine load. However, provisions are not included for assessing automatic operation of the turbine control system and the test needs to be revised accordingly.

5) Tier 2 Test 14.2.12.18.1 specifies load swing testing. The staff found that the test description is incomplete or requires clarification with respect to the following items:

a. Test prerequisites need to specify turbine generator controls are in automatic.

b. The test method section needs to specify how load changes will be accomplished.

c. Test method Items 3.2 and 3.3 specify conditions for acceptance and need to be relocated to the acceptance criteria section.

d. The data requirement section needs to specify monitoring and recording of other plant data as necessary to confirm acceptable plant performance consistent with the test objectives.

e. Item 5.1 of the acceptance criteria needs to make reference to Tier 2 Section 10.2 for secondary plant performance, and plant performance in this regard needs to be described in Section 10.2.

6) Tier 2 Test 14.2.12.18.13 specifies load follow testing. The test method indicates that plant behavior is monitored, and data collection focuses primarily on reactor performance. The acceptance criteria specify that the plant response should be in accordance with design, and refers to Tier 2 Section 10.2. However, Section 10.2 relates primarily to secondary plant performance. Provisions need to be included in the load follow test to address both primary and secondary plant performance, including turbine generator control system performance.

7) Tier 2 Test 14.2.12.21.4 specifies turbine generator load rejection testing. The staff found that the test description is incomplete or requires clarification with respect to the following items:

a. The prerequisites need to specify that the turbine generator control and overspeed protection systems are fully functional and operating in automatic.

b. The prerequisites need to include confirmation that manual turbine overspeed protection is available and functioning properly in the control room and locally at the turbine, and that these trip devices are manned before proceeding with the rest of the test.

c. The Test Methods section needs to include provisions for evaluating secondary plant performance and response.

d. Items 3.2 and 3.3 of the Test Methods Section are verification steps and are not test methods.

e. The test needs to include parameters that must be monitored (or make reference to the appropriate Tier 2 FSAR sections where these parameters are discussed) in order to assess and confirm that the secondary plant response satisfies design specifications.

f. The acceptance criteria need to include confirmation that the turbine does not trip as a consequence of load rejection.

g. The acceptance criteria need to include provisions for confirming that the performance of plant systems and equipment, including turbine control and overspeed protection systems and associated components, is consistent with design specifications and the description provided in Chapter 10 of the FSAR.

8) It isn't clear what combination of test procedures specified in Tier 2 Section 14.2 are intended to test the turbine generator control and overspeed protection systems in their entirety, including performance of all components, diagnostic routines, and failure modes. Additional information is needed to identify the specific test procedures that are credited in this regard.

14.03.07-36

The review procedures in SRP Section 14.3.7 provide guidance for determining the acceptability of proposed inspections, tests, analyses, and acceptance criteria (ITAAC). The SRP guidance specifies in part that all Tier 1 information is consistent with Tier 2 information and that plant systems are clearly described in Tier 1, including (for example) key performance characteristics. Tier 1 Section 2.8.1 establishes ITAAC for the turbine-generator. However, the staff found the descriptive information and corresponding ITAAC in this section to be inadequate. In particular, additional information is needed to address the following items:

1) Paragraph 2.0 is duplicated and this editorial error needs to be corrected.

2) Paragraph 1.0 indicates that turbine overspeed protection is provided by a separate turbine overspeed protection system, in addition to the normal speed control function. However, this description is incorrect in that turbine overspeed protection is provided by a primary turbine overspeed protection system and a backup turbine overspeed protection system, in addition to the normal speed control function. Consequently, this information needs to be corrected.

3) Paragraph 1a indicates that turbine stop and control valves will be inservice tested and inspected at intervals in accordance with industry practice or as specified by the manufacturer to meet turbine missile generation probability requirements. This does not appear to be reflected in Tier 2 of the FSAR and in particular, the considerations specified in Tier 2 Section 10.2.2.12 have not been included. Also, tests and inspections that are necessary for the extraction steam non-return valves are not specified. Therefore, the FSAR needs to be revised accordingly.

4) The basic configuration of the turbine-generator system is shown in Tier 1 Figure 2.8.1-1. However, the figure is incomplete in that it does not show all major components that are important to ensure that the turbine does not exceed design overspeed conditions. In particular, the figure needs to be revised to not only show the high pressure turbine stop and control valves, but the intermediate pressure turbine reheat stop and intercept valves and the extraction steam non-return valves (i.e., those that are important for preventing turbine overspeed) also need to be shown. Similarly, Tier 1 Table 2.8.1-1 needs to be revised to include these additional components.

5) Paragraph 2.1 indicates that the turbine-generator is favorably oriented with respect to protection from turbine missiles. However, the description needs to be more clear and specify that the orientation is favorable with respect to protection of safety-related SSCs from turbine missiles. Also, based on the description in Tier 2 Section 3.5.1.3, safety-related SSCs are located within the low-trajectory turbine missile strike zone and these safety-related SSCs need to be identified and the Tier 1 information needs to be revised accordingly.

6) Paragraph 3 and Item 3.1 in Tier 1 Table 2.8.1-3 specify that controls exist in the main control room to trip the turbine generator. However, there is no recognition of the need to provide similar controls locally at the turbine-generator to enable plant operators (who are in the immediate vicinity of the turbine) to trip the turbine if the turbine control and overspeed protection systems should fail. Consequently, Tier 1 and Tier 2 of the FSAR need to be revised to reflect this information.

7) Paragraph 3.1 indicates that turbine-generator overspeed protection systems are listed in Tier 1 Table 2.8.1-2. However, the intent of this table is to list the equipment instrumentation and controls, and electrical design as reflected by the title of the table, “Turbine-Generator System Equipment I&C and Electrical Design.” Consequently, this table needs to be revised to list the major I&C and electrical design components that make up each of the turbine-generator overspeed protection systems.

8) Paragraph 4.0, specifies that the turbine stop and control valves fail closed on a loss of power. Likewise, the intermediate pressure turbine reheat stop and intercept valves, and the extraction steam non-return valves are important for preventing turbine overspeed conditions and failure modes for these valves also need to be specified.

9) The information provided for Item 2.2 in Tier 1 Table 2.8.1-3 does not provide sufficient specificity to enable inspectors to complete this ITAAC. In particular, this item needs to be revised to address the following considerations:

    a. The first and third columns indicate that the orientation of the turbine generator is favorable with respect to protection from turbine missiles. To be clear, these

columns need to be revised to indicate that the orientation of the turbine generator is favorable with respect to protection of safety-related SSCs from turbine missiles. Also, safety-related SSCs that are located in the low-trajectory turbine missile strike zone as allowed by the design certification need to be identified. For example, the following statement (or similar) could be used: "Safety-related SSCs that are located in the low-trajectory turbine missile strike zone are limited to [list those that apply]."

b. For clarity, the second column needs to be revised to state that an inspection will be performed of the orientation of the turbine-generator with respect to the location of safety-related SSCs.

c. The third column needs to specify what constitutes "favorable orientation" such as by referring to the figure in Regulatory Guide 1.115.

10) The information provided for Item 2.3 in Tier 1 Table 2.8.1-3 does not provide sufficient specificity to enable inspectors to complete this ITAAC. In particular, this item needs to be revised to identify the turbine-generator system equipment that is subject to inspection, such as by listing this information in Tier 1 tables and by making reference to these tables in the ITAAC.

11) The information provided for Item 3.1 in Tier 1 Table 2.8.1-3 does not provide sufficient specificity to enable inspectors to complete this ITAAC. In particular, the information in the second column needs to be revised to specify that inspections and tests will be performed to confirm that (a) a manual trip device for tripping the turbine-generator is provided in the MCR; and (b) when actuated, the manual trip device generates control signals that will cause the valves listed in Tier 1 Table 2.8.1-1 to go closed. Also, a similar item needs to be established for the manual trip device that is located at the turbine.

12) The information provided for Item 3.2 in Tier 1 Table 2.8.1-3 does not provide sufficient specificity to enable inspectors to complete this ITAAC. In particular, the information in the second column needs to be revised to specify that tests will be performed to determine the trip setpoints for the primary and backup overspeed protection systems. The information in the third column needs to specify what the allowable trip setpoints are for the primary and backup turbine overspeed protection systems.