ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Monday, May 11, 2009 4:54 PM
To: Getachew Tesfaye
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); SLIVA Dana (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 216, FSAR Ch 8
Attachments: RAI 216 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 216 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the 4 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 216 Questions 08.02-7 and 08.04-9.

The following table indicates the respective pages in the response document, "RAI 216 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 216 — 08.02-7	2	2
RAI 216 — 08.03.01-23	3	3
RAI 216 — 08.03.01-24	4	5
RAI 216 — 08.04-9	6	6

This concludes the formal AREVA NP response to RAI 216 and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, April 16, 2009 8:22 AM
To: ZZ-DL-A-USEPR-DL
Cc: Peter Kang; Ronaldo Jenkins; James Steckel; Joseph Colaccino; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 216 (2544, 2542,2543), FSAR Ch. 8

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on April 14, 2009, and on April 15, 2009, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
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Subject: Response to U.S. EPR Design Certification Application RAI No. 216, FSAR Ch 8
Sent Date: 5/11/2009 4:54:13 PM
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From: WELLS Russell D (AREVA NP INC)

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RAI 216 Response US EPR DC.pdf	144489	

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Sensitivity: Normal
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Response to

Request for Additional Information No. 216 (2544, 2542, 2543), Revision 0

4/16/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 08.02 - Offsite Power System
SRP Section: 08.03.01 - AC Power Systems (Onsite)
SRP Section: 08.04 - Station Blackout
Application Section: 8.2

QUESTIONS for Electrical Engineering Branch (EEB)

Question 08.02-7:

As a followup to RAI 9, Question 08.02-6, the staff believes that the Objective (item 1.1) of loss of offsite load (Test # 221) indicates “To demonstrate that the plant responds and is controlled as designed following a loss of offsite loads.” The staff finds the objective not consistent with the intent of the RAI response. Revise the test objective if necessary.

Response to Question 08.02-7:

U.S. EPR FSAR Tier 2, Section 14.2.12.21.4 and Table 14.2-1—List of Initial Tests for the U.S. EPR, test title will be revised to indicate, “Turbine-Generator Load Rejection.” Test description Sections 1.1 and 4.1 will be revised to indicate turbine-generator load rejection instead of a loss of offsite load and trip, respectively. In Section 14.2.12.21.4, Test Method Section 3.1 will be revised to further clarify that the turbine-generator circuit breakers being opened are in the switchyard.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12.21.4 and Table 14.2-1 will be revised as described in the response and indicated on the enclosed markup.

Question 08.03.01-23:

As a followup to RAI 11, Question 08.03.01-7 (Page 4 of 38) in connection with Section B.4 of BTP 8-6, the response indicated that the verification test of the analysis is the responsibility of the COL holder. Correct the response from COL holder to COL applicant.

Response to Question 08.03.01-23:

The response to RAI 11 Question 08.03.01-7 describes the performance of voltage measurements in the as-built electrical distribution system as described in Section B.4 of BTP 8-6, “Adequacy of Station Electric Distribution System Voltages.” The third paragraph of the response indicates, “Performance of the test is the responsibility of the COL holder.” This portion of the response is corrected as requested to indicate, “Performance of the test is the responsibility of the COL applicant.”

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 08.03.01-24:

As a followup to RAI 9, Question 08.01-3 (Page 8 of 15), degraded grid voltage (DGV) (10.a) and EDG start on loss of offsite power (LOOP) (10.b) will be provided in Chapter 16 (TS) Table 3.3.1-2. The selection of those setpoints (for relays and time delays) is determined from analysis based on the grid voltage requirements of the Class 1E loads and the guidance for the analysis and performance of verification test in Branch Technical Position 8-6. Explain whether the above trip setpoints should be set differently when the alternate feed is established for an EDG's inoperability duration (i.e., 120 days).

Response to Question 08.03.01-24:

The emergency diesel generator (EDG) start on degraded grid voltage (DGV) (10.a), and EDG start on loss of offsite power (LOOP) (10.b) setpoints indicated in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Table 3.3.1-2— Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1, are not changed when an alternate feed is implemented. These setpoints were evaluated using limiting load flow analysis results so that it will not be necessary to make setting changes when the alternate feed is established.

The lower limit for DGV is determined by the limiting component, which for the U.S. EPR is the large medium voltage motors. The load flow analysis was performed with the alternate feed connection in place. This results in the largest calculated voltage drop, although the DGV instrumentation is at the medium voltage level so that for any particular DGV setpoint voltage, the voltage seen by downstream components is not significantly affected by the alternate feed connection.

The upper limit for DGV corresponds to the lowest bus voltage that allows for reset, as well as precludes unnecessary operation of the relays on a temporary voltage dip. The reset point was calculated by determining the recovery voltage following a large break loss of coolant accident (LOCA), coincident with the lowest predicted steady state bus voltage, considering properly calibrated and functioning on-load tap changers, and then applying the minimum deadband and additional margin to account for on-load tap changers that may not be operating in automatic mode. The additional margin also provides a degree of protection against minor malfunctions of the on-load tap changers. The DGV upper limit calculation is not significantly affected by the alternate feed connection.

The DGV protection logic works as described in Branch Technical Position (BTP) 8-6. The time delay without a safety injection actuation signal (SIAS) reflects engineering judgment and existing plant operating experience. It is not affected by the alternate feed connection. The lower limit of the time delay with SIAS is the bounding acceleration time for large motors expected to start on a LOCA, based on the starting times at reduced voltage. The upper limit of the DGV time delay is the bounding time that provides safety injection and emergency feedwater flow, as appropriate, within the delays permitted by the accident analysis, when considering the auxiliary logic and breaker operating times, EDG start time, sequencing times, pump acceleration times, and margin. There are no time-limiting components on the alternate feed buses that would require setpoint adjustment during alternate feed. The DGV sensing location will be such that the sensed voltage will be essentially the same as the switchgear voltage for the largest emergency power supply system (EPSS) supplied motors. Therefore, the alternate feed connection has minimal effect on the DGV setpoint.

The lower limit for the loss of voltage (LOV) voltage setpoint allows for the setpoint to be high enough so that the loss of voltage signal is not unnecessarily delayed by the final portion of the plants voltage decay decrement curve. Since the U.S. EPR voltage logic is modeled after the arrangement described in BTP 8-6, buses may experience degraded voltage for several minutes if a safety injection signal is not present. Because of this logic, the LOV voltage setpoint lower limit is as close as practical to the upper limit, after considering measurement uncertainties and margin. The upper limit is set to preclude interaction between the loss of voltage function and the load sequencer. Since the Class 1E load shedding scheme is automatically bypassed during sequencing of emergency loads, the upper limit is the lower of (a) the minimum final step voltage from the EDG transient analysis, or (b) the minimum LOCA sequencing voltage without actuation of the degraded/loss of voltage scheme. The lowest voltages, with the highest total load, occur with the alternate feed connection in place, and these results are used to derive the LOV voltage setpoint, so that the most limiting setpoint is used at all times. Therefore, no LOV voltage setpoint change is needed for the alternate feed connection.

The lower limit for the LOV time setpoint is a function of the fast bus transfer time (i.e., the time required to transfer to the alternate source) combined with consideration of the bus voltage decay decrement curve's contribution to the total time required to restore power. Because the voltage setpoint is set high in the available setting band, as described previously, the voltage decay decrement curve's time delay contribution is not significant. Therefore, the lower limit is primarily a function of the fast bus transfer time, which is independent of the alternate feed connection.

The upper limit for the LOV time setpoint is required to not lengthen the accident sequence time. The EDG start signal is developed from the DGV signal as well as the LOV signal, so that the loss of voltage signal will have no impact on the ability to meet the accident analysis safety injection and emergency feedwater initiation times. Since a large delay is unnecessary, the setpoint is established in the fast end of the allowable band, thus reducing the amount of time the Class 1E buses will be connected at severely reduced voltages. Therefore, the LOV time setpoint is unaffected by the alternate feed connection.

In summary, the upper and lower setting band limits for the DGV and LOV time and voltage setpoints include consideration of the alternate feed connection, and do not require revised setpoints when the alternate feed connection is implemented.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 08.04-9:

Follow up to RAI 11, Question 08.04-4:

Page 8.4-13 (8.4.2.6.4), item 8.4-2 of Table 1.8-2 of the FSAR, indicates "a COL applicant that references the U.S. EPR design certification will address the RG 1.155 position C.3.4 related to procedures and training to cope with SBO." Please indicate whether the subject Table will include C.1.3 (restoring emergency ac power) and C.2 (restoring offsite power) positions to C.3.4 (procedure and training) or provide justification for any exception.

Response to Question 08.04-9:

U.S. EPR FSAR Tier 2, Section 8.4.2.6.4 will be revised to indicate, "A COL applicant that references the U.S. EPR design certification will address the RG 1.155 guidance related to procedures and training to cope with SBO. Specific items covered related to procedures and training include:

- Regulatory Position C.1.3 — guidelines and procedures for actions to restore emergency AC power when the emergency AC power system is unavailable will be integrated with plant specific technical guidelines and emergency operating procedures.
- Regulatory Position C.2 — procedures will include the actions necessary to restore offsite power and use nearby power sources when offsite power is unavailable.
- Regulatory Position C.3.4 — procedures and training will include operator actions necessary to cope with a station blackout for at least the duration determined according to RG 1.155 regulatory position C.3.1 and will include the operator actions necessary to restore normal decay heat removal once AC power is restored."

U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items, Item number 8.4-2 description will be changed to indicate, "A COL applicant that references the U.S. EPR design certification will address the RG 1.155 guidance related to procedures and training to cope with SBO."

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 8.4.2.6.4 and Table 1.8-2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 1.8-2—U.S. EPR Combined License Information Items
Sheet 27 of 44

08.04-9

Item No.	Description	Section	Action Required by COL Applicant	Action Required by COL Holder
8.4-2	A COL applicant that references the U.S. EPR design certification will address the RG 1.155 ~~position C.3.4~~guidance related to procedures and ~~training to cope with SBO~~.	8.4.2.6.4	Y	
9.1-1	A COL applicant that references the U.S. EPR design certification will provide site-specific information on the heavy load handling program, including a commitment to procedures for heavy load lifts in the vicinity of irradiated fuel or safe shutdown equipment, and crane operator training and qualification.	9.1.5.2.5	Y	
9.1-2	A COL applicant that references the U.S. EPR design certification will demonstrate that the design satisfies the criticality analysis requirements for the new and spent fuel storage racks, and describe the results of the analyses for normal and credible abnormal conditions, including a description of the methods used, approximations and assumptions made, and handling of design tolerances and uncertainties.	9.1.1.3	Y	
9.1-3	A COL applicant that references the U.S. EPR design certification will describe the new fuel storage racks, including a description of confirmatory structural dynamic and stress analyses	9.1.2.2.1	Y	
9.1-4	A COL applicant that references the U.S. EPR design certification will describe the spent fuel storage racks, including a description of confirmatory structural dynamic and stress analyses and thermal-hydraulic cooling analyses.	9.1.2.2.2	Y	
9.2-1	A COL applicant that references the U.S. EPR design certification will provide site specific information for the UHS ~~make up.~~support systems such as makeup water, blowdown, and chemical treatment (to control biofouling).	9.2.5.2	Y	

of AAC power sources between a~~n~~ U.S. EPR plant and other units on the same site. Other units on a multiple-unit site must have their own AAC power source. Put differently, this paragraph is not applicable~~,~~ because an AAC power source will not be permitted to serve a multi-unit site that includes a~~n~~ U.S. EPR plant. Similarly, the subsequent paragraph in RG 1.155, pertaining to the situation where on~~-~~site emergency sources are shared between units, is not applicable to the U.S. EPR~~,~~ because the U.S. EPR design does not permit sharing of emergency sources between units.

The SBODGs are installed in a non-seismically designed building, housing non-safety-related components. The SBODG failures can not affect systems required for a design basis accident (DBA).

8.4.2.6.4 RG 1.155 C.3.4 – Procedures and Training to Cope with Station Blackout (Procedures and Training)

08.04-9

A COL applicant that references the U.S. EPR design certification will address the RG 1.155 guidance~~position C.3.4~~ related to procedures and training to cope with SBO.

Specific items covered related to procedures and training include:

- Regulatory Position C.1.3 — guidelines and procedures for actions to restore emergency AC power when the emergency AC power system is unavailable will be integrated with plant-specific technical guidelines and emergency operating procedures.
- Regulatory Position C.2 — procedures will include the actions necessary to restore offsite power and use nearby power sources when offsite power is unavailable.
- Regulatory Position C.3.4 — procedures and training will include operator actions necessary to cope with a station blackout for at least the duration determined according to RG 1.155 regulatory position C.3.1 and will include the operator actions necessary to restore normal decay heat removal once AC power is restored.

8.4.2.7 Quality Assurance

RG 1.155 provides quality assurance (QA) and specification guidance for the SBODG. RG 1.155 Appendices A and B provide guidance on QA activities and specifications respectively for non-safety-related equipment used to meet the requirements of 10 CFR 50.63 and not already covered by existing QA requirements in Appendix B or R of 10 CFR 50. The guidance on QA and specifications incorporates a lesser degree of stringency (as compared with 10 CFR 50 Appendix B) by eliminating requirements for involvement of parties outside the normal line organization. It is anticipated that NRC inspections will focus on the implementation and effectiveness of the quality controls described in RG 1.155 Appendices A and B. Equipment installed to meet the SBO rule

5.0 ~~ACCEPTANCE CRITERIA~~

5.1 ~~The plant responds as described in Section 10.2.~~

14.2.12.21.4 ~~Loss of Offsite Load~~Turbine-Generator Load Rejection (Test #221)

08.02-7

1.0 OBJECTIVE

1.1 ~~To demonstrate that the plant responds and is controlled as designed following a loss of offsite load~~turbine-generator load rejection.

1.2 This procedure shall be performed at the following plateau:

1.2.1 ≥98 percent reactor power in accordance with RG 1.68.

2.0 PREREQUISITES

2.1 The following systems are in automatic operation:

2.1.1 Primary and secondary level controls (e.g., pressurizer, feedwater heaters, VCT, deaerator, SG).

2.1.2 Primary and secondary pressure controls (e.g., pressurizer, VCT, condensate).

2.1.3 Primary and secondary flow controls (e.g., CVCS letdown, feedwater).

2.1.4 Primary and secondary temperature controls (e.g., RCS T_{avg}).

2.1.5 RCSL control of RCCAs.

3.0 TEST METHOD

3.1 The turbine-generator is removed from the grid by opening the output breakers in the switchyard.

3.2 Verify that RCPs continue to operate with power supplied from the offsite grid.

3.3 Verify that a partial rod trip occurs but the reactor remains critical.

3.4 ~~Verify that the turbine-generator continues to provide house loads.~~

08.02-7

3.5 The plant behavior is monitored to establish that the control systems maintain the NSSS within operating limits.

4.0 DATA REQUIRED

4.1 Plant condition prior to ~~trip~~turbine-generator load rejection.

4.2 The following acceptance criteria parameters are monitored prior to and throughout the transient:

4.2.1 Pressurizer parameters (i.e., pressure and level).

4.2.2 RCS temperatures (i.e., T_{cold}, T_{hot} and T_{avg}).

4.2.3 SG parameters (i.e., flow, pressure, temperature and level).

Table 14.2-1—List of Initial Tests for the U.S. EPR
Sheet 13 of 14

Test #	Test Name	FSAR or COLA Test	Applicable Section of RG 1.68, Revision 3	Other RG
210	Penetration Temperature Survey	FSAR	Appendix A, 5.w	
211	Remote Shutdown ~~Panel~~Station Checkout	FSAR	Appendix A, 5.dd	RG 1.68.2
212	Biological Shield Survey	FSAR	Appendix A, 5.bb	
213	Single RCCA Misalignment	FSAR	Appendix A, 5.f & 5.i	
214	Securing A Single Train Of Feedwater Heaters	FSAR	Appendix A, 5.v & 5.kk	
215	Liquid Waste Storage and Processing Systems	FSAR	Appendix A, 5.z & 5.cc	
216	Gaseous Waste Processing System	FSAR	Appendix A, 5.cc	
217	Loss Of Feedwater Pump	FSAR	Appendix A, 5.v	
218	HZP to HFP Reactivity Difference	FSAR	Appendix A, 5.a	
219	Trip of Generator Main Breaker	FSAR	Appendix A, 5.ll & 5.mm	
220	Load Follow	FSAR	Appendix A, 5.v	
221	~~Loss Of Offsite Load~~Turbine-Generator Load Rejection	FSAR	Appendix A, 5.j	
222	~~Actual Rod Drop Times~~	FSAR	Appendix A, 5.h	
223	Cooling Tower Acceptance	COLA	Appendix A, ~~5~~1.f	
224	Access Building Ventilation System	FSAR	Appendix A, ~~5~~1.n(14)	
225	Potable and Sanitary Water Systems	FSAR	Appendix A, 1.n~~.~~	
226	Pre-Core Electrical Distribution System Voltage Verification	FSAR	Appendix A, 1.g(2)	

08.02-7