ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, March 01, 2013 1:19 PM
To: Snyder, Amy
Cc: DELANO Karen (AREVA); LEIGHLITER John (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); TOLLEY Tracey (AREVA); VANCE Brian (AREVA); WELLS Russell (AREVA); WILLS Tiffany (AREVA); NOXON David (AREVA); KISER Marcia (AREVA); HESS Mel (AREVA)
Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 564 (6901), FSAR Ch. 8, Question 08.02-8
Attachments: RAI 564 Question 08.02-8 Advanced Response US EPR DC.pdf

Amy,

Attached is an Advanced Response to RAI No.564, Question 08.02-8 in advance of the final response date of April 30, 2013.

To keep our commitment to send a final response to this question by the commitment date, we need to receive all NRC staff feedback and comments no later than **April 16, 2013**.

Please let me know if NRC staff has any questions or if this response can be sent as final.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, December 19, 2012 10:43 AM
To: 'Snyder, Amy'
Cc: DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLS Tiffany (CORP/QP); NOXON David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 564 (6901), FSAR Ch. 8

Amy,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 564 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the question cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 564 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 564 — 08.02-8	2	2

The schedule for a technically correct and complete response to the single question is provided below.

Question #	Response Date
RAI 564 — 08.02-8	April 30, 2013

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: Snyder, Amy [mailto:Amy.Snyder@nrc.gov]
Sent: Friday, November 23, 2012 3:56 PM
To: ZZ-DL-A-USEPR-DL
Cc: Kang, Peter; Anderson, James; Mitra, Sikhindra; Segala, John; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 564 (6901), FSAR Ch. 8

Attached please find the subject request for additional information (RAI). A draft of the RAI was provided to you on October 17, 2012, and on October 29, 2012 you informed us that the RAI is clear and no further clarification is needed. As 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 RAI question 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.

Thank You,

Amy

Amy Snyder, U.S. EPR Design Certification Lead Project Manager
Licensing Branch 1 (LB1)
Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission
☎ Office: (301) 415-6822
Fax: (301) 415-6406
Mail Stop: T6-C20M
E-mail: Amy.Snyder@nrc.gov

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 4249

Mail Envelope Properties (554210743EFE354B8D5741BEB695E6560E9D8D)

Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 564 (6901), FSAR Ch. 8, Question 08.02-8
Sent Date: 3/1/2013 1:18:35 PM
Received Date: 3/1/2013 1:18:45 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

Recipients:
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"LEIGHLITER John (AREVA)" <John.Leighliter@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"TOLLEY Tracey (AREVA)" <Tracey.Tollar@areva.com>
Tracking Status: None
"VANCE Brian (AREVA)" <Brian.Vance@areva.com>
Tracking Status: None
"WELLS Russell (AREVA)" <Russell.Wells@areva.com>
Tracking Status: None
"WILLS Tiffany (AREVA)" <Tiffany.Wills@areva.com>
Tracking Status: None
"NOXON David (AREVA)" <David.Noxon@areva.com>
Tracking Status: None
"KISER Marcia (AREVA)" <Marcia.Kiser@areva.com>
Tracking Status: None
"HESS Mel (AREVA)" <Melvin.Hess@areva.com>
Tracking Status: None
"Snyder, Amy" <Amy.Snyder@nrc.gov>
Tracking Status: None

Post Office: FUSLYNCMX03.fdom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	3547	3/1/2013 1:18:45 PM
RAI 564 Question 08.02-8 Advanced Response US EPR DC.pdf	153104	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No.564, Question 8.02-8

11/23/12
U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 08.02 - Offsite Power System
Application Section: 08.02
EEB Branch

Question 08.02-8:

On July 27, 2012, the NRC issued Bulletin 2012-01, "Design Vulnerability in Electric Power System," (Agencywide Documents Access and Management System (ADAMS) Accession Number ML12074A115) to all holders of operating licenses and combined licenses for nuclear power reactors requesting information about the facilities' electric power system designs, in light of the recent operating experience that involved the loss of one of the three phases of the offsite power circuit (single-phase open circuit condition) at Byron Station, Unit 2 to verify compliance with applicable regulations and to determine if further regulatory action is warranted.

In order to verify the applicants of new reactors have addressed the design vulnerability identified at Byron in accordance with the requirements specified in General Design Criterion (GDC) 17, "Electric Power Systems," in Appendix A, "General Design Criteria for Nuclear Power Plants," and the design criteria for protection systems under 10 CFR 50.55a(h)(3), please provide the following information:

- Describe the protection scheme design for important to safety buses (31-34BDA) to detect and automatically respond to a single-phase open circuit condition or high impedance ground fault condition on credited offsite power circuits.
- If the important to safety buses are not powered by offsite power sources during at power condition, explain how the surveillance tests (e.g., SR 3.8.1.1) are performed to verify that a single-phase open circuit condition or high impedance ground fault condition on an off-site power circuit is detected.
- Describe the plant operating procedures including off-normal operating procedures, specifically calling for verification of the voltages on all three phases of the ESF buses.

Response to Question 08.02-8:

Part 1:

The four Class 1E Emergency Power Supply System (EPSS) Buses 31-34BDA of the U.S. EPR design are powered from two, 3-winding Emergency Auxiliary Transformers (EAT), 30BDT01 and 30BDT02. The three windings of each EAT are connected Wye; the primary, high-voltage side neutral is solidly grounded, and the two secondary, low-voltage side neutrals are each high-impedance grounded. Although each EAT has the capacity and capability to power all four EPSS buses (31-34BDA) under all design basis conditions, the normal operating configuration is for each EAT secondary winding to power a single EPSS bus. This normal operating configuration maintains the EATs very lightly loaded except during abnormal or accident situations.

The U.S. EPR employs a 2-level voltage protection scheme for each of the Class 1E EPSS buses that monitor all three phases of bus voltage. The logic for tripping offsite power and starting the diesel for each bus from either the 1st or 2nd level voltage protection scheme is 2-out-of-3. This scheme, along with sensitive ground detection on each EAT, is capable of open-phase or high-impedance ground detection inside the plant. Since the EPSS buses are normally very lightly loaded, additional protective features such as voltage or current imbalance at the EPSS buses would not provide reliable detection of an open phase or high-impedance ground on the offsite circuits.

The existing U.S. EPR design of 3-phase voltage monitoring with 2-out-of-3 logic eliminates one of the Byron design vulnerabilities, that of 2-phase voltage monitoring with 2-out-of-2 logic.

Additional information on the offsite power system is provided in U.S. EPR FSAR, Tier 2, Section 8.2.1.1.

Detection of an open phase or high impedance ground fault condition in the offsite circuits connected to the plant requires site specific information associated with the switchyard and the offsite power grid connections. Therefore, to address RAI 564, the COL item in U.S. EPR FSAR Tier 2 Section 8.2.1.1 and U.S. EPR FSAR Tier 2 Table 1.8-2 (Item 8.2-1) will be revised to specifically address and reference NRC Bulletin 2012-01.

Part 2:

Except in the unlikely event of a loss of offsite power (LOOP), the four 6.9kV EPSS buses are always powered by the EATs via at least two offsite circuits.

Part 3:

Specifics regarding operating procedures are the responsibility of the COL applicant (Refer to U.S. EPR FSAR, Tier 2, Section 13.5).

FSAR Impact:

US EPR FSAR, Tier 2, Section 8.2 and Table 1.8-2 will be revised as described in the response and indicated in the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 1.8-2—U.S. EPR Combined License Information Items
Sheet 20 of 40

Item No.	Description	Section
8.1-2	A COL applicant that references the U.S. EPR design certification will identify site-specific loading differences that raise EDG or Class 1E battery loading, and demonstrate the electrical distribution system is adequately sized for the additional load.	8.1.3
8.2-1	A COL applicant that references the U.S. EPR design certification will provide site-specific information regarding the offsite transmission system and connections to the station switchyard; including consideration of NRC Bulletin 2012-01 to address detection, notification, and clearing of an open single phase condition or high impedance ground fault in the offsite circuits. ~~A COL applicant that references the U.S. EPR design certification will provide site specific information regarding the offsite transmission system and their connections to the station SWYD.~~	8.2.1.1
8.2-2	A COL applicant that references the U.S. EPR design certification will provide site-specific information for the switchyard layout design.	8.2.1.2
8.2-3	A COL applicant that references the U.S. EPR design certification will provide site-specific information that identifies actions necessary to restore offsite power and use available nearby power sources when offsite power is unavailable.	8.2.2.7
8.2-4	A COL applicant that references the U.S. EPR design certification will provide a site-specific grid stability analysis.	8.2.2.4
8.2-5	A COL applicant that references the U.S. EPR design certification will provide site-specific information for the protective devices that control the switchyard breakers and other switchyard relay devices.	8.2.1.2
8.2-6	A COL applicant that references the U.S. EPR design certification will provide site-specific information for the station switchyard equipment inspection and testing plan.	8.2.2.5
8.2-7	A COL applicant that references the U.S. EPR design certification will provide site specific information regarding the communication agreements and protocols between the station and the transmission system operator, independent system operator, or reliability coordinator/authority. Additionally, the applicant will provide a description of the analysis tool used by the transmission system operator to determine, in real time, the impact that the loss or unavailability of various transmission system elements will have on the condition of the transmission system to provide post-trip voltages at the switchyard. The information provided will be consistent with information requested in NRC generic letter 2006-02.	8.2.1.1

8.2 Offsite Power System

8.2.1 Description

8.2.1.1 Offsite Power

The offsite power system provides power from the transmission system, via the station switchyard, to the plant Class 1E and non-Class 1E electrical distribution system. The offsite power system includes all transmission lines connected to the switchyard, the switchyard equipment (overhead buses, circuit breakers, disconnect air switches), auxiliary transformers, and ends at the input terminals of the switchgear circuit breakers. The preferred power supply (PPS) is the offsite power from the transmission system to the Class 1E emergency power supply system (EPSS) that is preferred to provide power under accident and post-accident conditions. The offsite transmission system and connections to the station switchyard are site-specific. A COL applicant that references the U.S. EPR design certification will provide site-specific information regarding the offsite transmission system and connections to the station switchyard; including consideration of NRC Bulletin 2012-01 to address detection, notification, and clearing of an open single phase condition or high impedance ground fault in the offsite circuits (Reference 5).

The switchyard has connections to at least two transmission lines. The normally energized transmission lines are physically independent circuits that minimize the likelihood of their simultaneous failure under operating and environmental conditions and postulated events, including transmission tower or transmission line failure. These lines do not cross, and no other transmission lines cross above these two lines. Each offsite power circuit is sized to supply the station safety-related and non-safety-related loads during normal and abnormal operation.

The PPS supplies the station Class 1E EPSS buses from two independent overhead lines between the switchyard and the station transformer area via two emergency auxiliary transformers (EAT). The station remains connected to the offsite power sources during normal plant operation regardless of main generator status, without transferring buses or power sources during startup, full power operation, or shutdown. Each PPS circuit is normally in service through its respective EAT.

Two additional overhead lines provide power to two normal auxiliary transformers (NAT) for the station non-Class 1E normal power supply system (NPSS) buses.

Each auxiliary transformer is provided with two on-load tap changers to maintain the supplied bus voltage at the nominal value during transmission system voltage fluctuations, or voltage changes as a result of changes in bus loading. The reference voltage for the on-load tap changer operation is provided by voltage transformers at the respective bus to which the secondary winding is connected. Momentary bus voltage transients (e.g., motor starting) do not result in tap changers affecting bus

3. BTP 8-3, "Stability of Offsite Power Systems," U.S. Nuclear Regulatory Commission, Standard Review Plan, Branch Technical Position, Rev. 3, 2007.

4. BTP 8-6, "Adequacy of Station Electric Distribution System Voltages," U.S. Nuclear Regulatory Commission, Standard Review Plan, Branch Technical Position, Rev. 3, 2007.

5. NRC Bulletin 2012-01, "Design Vulnerability in Electric Power System," U.S. Nuclear Regulatory Commission, July 2012.