ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Monday, January 31, 2011 9:21 AM
To: Tesfaye, Getachew
Cc: DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); WILLIFORD Dennis (AREVA); COLEMAN Sue (AREVA); Canova, Michael; DOYEL Chris (AREVA); SMALL Shelby (AREVA); GARDNER Darrell (AREVA)
Subject: FW: DRAFT Response to U.S. EPR Design Certification Application RAI No. 442, FSAR Ch. 7, Questions 7.9-61 and 7.9-67
Attachments: RAI 442 Question 07.09-61 and 07.09-63 Response US EPR DC - DRAFT.pdf

Getachew,

To support the final response date, a draft response to RAI 442 questions 7.9-61and 7.9-63 is being provided.
Let me know if the staff has questions or if the response can be sent as final.

Thanks,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Friday, January 07, 2011 11:15 AM
To: Tesfaye, Getachew
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); RYAN Tom (RS/NB); PANNELL George (CORP/QP)
Subject: Response to U.S. EPR Design Certification Application RAI No. 442, FSAR Ch. 7, Supplement 1

Getachew,

On November 19, 2010, AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the questions in RAI 442. To allow additional time to interact with the staff a revised schedule is provided below for questions 7.1.29, 7.1.32, 7.9-65 and 7.9-67. The schedule for the other questions remains unchanged.

AREVA NP's schedule for providing a technically correct and complete response to all questions in RAI 442 is provided below.

Question #	Response Date
RAI 442 — 7.1-26	March 15, 2011
RAI 442 — 7.1-27	March 15, 2011
RAI 442 — 7.1-28	March 15, 2011
RAI 442 — 7.1-29	**February 9, 2011**
RAI 442 — 7.1-30	February 9, 2011
RAI 442 — 7.1-31	March 15, 2011
RAI 442 — 7.1-32	**February 9, 2011**
RAI 442 — 7.3-32	February 9, 2011

RAI 442 — 7.3-33	February 9, 2011
RAI 442 — 7.3-34	March 15, 2011
RAI 442 — 7.9-61	February 9, 2011
RAI 442 — 7.9-62	February 9, 2011
RAI 442 — 7.9-63	February 9, 2011
RAI 442 — 7.9-64	March 15, 2011
RAI 442 — 7.9-65	**March 15, 2011**
RAI 442 — 7.9-66	February 9, 2011
RAI 442 — 7.9-67	**February 9, 2011**

Sincerely,

Martin (Marty) C. Bryan
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From: BRYAN Martin (External RS/NB)
Sent: Friday, November 19, 2010 5:12 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); PANNELL George (CORP/QP)
Subject: Response to U.S. EPR Design Certification Application RAI No. 442, FSAR Ch. 7

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 442 Response US EPR DC.pdf" provides a schedule since a technically correct and complete response to the 17 question (s) is not provided.

The following table indicates the respective pages in the response document, "RAI 442 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 442 — 7.1-26	2	2
RAI 442 — 7.1-27	3	3
RAI 442 — 7.1-28	4	4
RAI 442 — 7.1-29	5	5
RAI 442 — 7.1-30	6	6
RAI 442 — 7.1-31	7	8
RAI 442 — 7.1-32	9	9
RAI 442 — 7.3-32	10	10
RAI 442 — 7.3-33	11	11
RAI 442 — 7.3-34	12	12
RAI 442 — 7.9-61	13	13
RAI 442 — 7.9-62	14	14
RAI 442 — 7.9-63	15	15
RAI 442 — 7.9-64	16	16
RAI 442 — 7.9-65	17	17

RAI 442 — 7.9-66	18	18
RAI 442 — 7.9-67	19	19

A complete answer is not provided for the 17 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 442 — 7.1-26	March 15, 2011
RAI 442 — 7.1-27	March 15, 2011
RAI 442 — 7.1-28	March 15, 2011
RAI 442 — 7.1-29	January 7, 2011
RAI 442 — 7.1-30	February 9, 2011
RAI 442 — 7.1-31	March 15, 2011
RAI 442 — 7.1-32	January 7, 2011
RAI 442 — 7.3-32	February 9, 2011
RAI 442 — 7.3-33	February 9, 2011
RAI 442 — 7.3-34	March 15, 2011
RAI 442 — 7.9-61	February 9, 2011
RAI 442 — 7.9-62	February 9, 2011
RAI 442 — 7.9-63	February 9, 2011
RAI 442 — 7.9-64	March 15, 2011
RAI 442 — 7.9-65	January 7, 2011
RAI 442 — 7.9-66	February 9, 2011
RAI 442 — 7.9-67	January 7, 2011

Sincerely,

Martin (Marty) C. Bryan
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, October 20, 2010 8:09 AM
To: ZZ-DL-A-USEPR-DL
Cc: Zhao, Jack; Morton, Wendell; Mott, Kenneth; Spaulding, Deirdre; Truong, Tung; Zhang, Deanna; Jackson, Terry; Canova, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 442(4295,5076,5068,5067), FSAR Ch. 7

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on September 10, 2010, and discussed with your staff on October 13, 2010. Drat RAI Questions 07.01-26 and 07.03-33 were modified as a result of that discussion. 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
Email Number: 2497

Mail Envelope Properties (199EBB4D1CD9644D9472AA84D5D8EFA7192CF6)

Subject: FW: DRAFT Response to U.S. EPR Design Certification Application RAI No. 442, FSAR Ch. 7, Questions 7.9-61 and 7.9-67
Sent Date: 1/31/2011 9:21:06 AM
Received Date: 1/31/2011 9:21:43 AM
From: BRYAN Martin (EXTERNAL AREVA)

Created By: Martin.Bryan.ext@areva.com

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Files	**Size**	**Date & Time**	
MESSAGE	5958	1/31/2011 9:21:43 AM	
RAI 442 Question 07.09-61 and 07.09-63 Response US EPR DC - DRAFT.pdf			439525

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

Response to

Request for Additional Information No.442 (4295, 5076, 5068, 5067), Supplement 2, Revision 1

10/20/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 07.01 - Instrumentation and Controls - Introduction
SRP Section: 07.03 - Engineered Safety Features Systems
SRP Section: 07.09 - Data Communication Systems

Application Section: FSAR Ch 7
____ Branch

Question 07.09-61

Demonstrate how the use of SINEC H1 protocol which operates over Ethernet meets the reliability requirements of IEEE Std. 603-1998, Clause 5.15.

Clause 5.15 of IEEE Std. 603-1998 requires appropriate analysis be performed on the system design for which either quantitative or qualitative reliability goals have been established to determine that such goals have been achieved. To meet the requirements of IEEE Std. 603-1998, Clause 5.15, data communications systems in support of safety functions should demonstrate sufficient reliability in accordance with the acceptance criteria described in SRP Section 7.9. SRP Section 7.9 states that protocols proposed for use, whether standard or proprietary, should be analyzed for hazards and performance deficits posed by unneeded functionality and complication.

Topical Report EMF-2110(NP) states that two communications protocols are used in the TXS system, the SINEC L2 Profibus protocol and the SINEC H1 Ethernet protocol. In addition, Section 7.1.1.3.1 of the U.S. EPR, Tier 2, FSAR states that the TXS Ethernet protocol is also used between the Panel Interfaces (PI)s of the SICS and the Safety Qualified Display System (QDS) within the SICS. The staff finds that the applicant has not demonstrated how these protocols communicate deterministically for safety applications to meet the requirements of IEEE Std. 603-1998, Clause 5.15. Specifically, the applicant has not provided an analysis of hazards and performance of these two protocols to demonstrate that data communications using these protocols are deterministic. This is of special concern for SINEC H1 protocol since it is Ethernet-based, which typically has been shown to be non-deterministic. As such, the staff requests the applicant to provide additional information to demonstrate how data communications using these protocols are deterministic and to incorporate the response into the U.S. EPR, Tier 2, FSAR.

Response to Question 07.09-61

Table 07.09-61-1 presents elements that make a network deterministic.

The Teleperm XS (TXS) Topical Report EMF-2110(NP) describes the two protocols used in TXS-based systems. Topical Report EMF-2110(NP), Section 2.9.2 describes the Profibus (L2) protocol, and Section 2.9.3 describes the Ethernet (H1) protocol.

As shown in Table 07.09-61-1, both protocols used in TXS-based systems share common characteristics, which verify that the networks are deterministic. However, the protocols use different network architecture, which are point-to-point for Ethernet and token passing for Profibus.

Cyclic processing

Both the qualified display system (QDS) and the TXS use proprietary time-triggered operating systems that do not rely on hardware and interrupt only on cyclic processing of the software. Every operation is cyclic and predictive, which verifies that the output of messages on networks link prevents collision.

The hardware components only read the incoming memory buffer or generate a packet to send only when the operating system generates the order. The cyclic operations of the processing units verify that the operator does not simultaneously perform a reading and writing operation.

The communication process sends information written in memory and writes in memory received information. Packet numbering verifies that information is only processed once and that the information is processed without relying on synchronizing both tasks.

Static memory allocation

Every TXS-based application has its memory allocated statically at its design, and this value does not change. The memory messages are predefined, and only the signal values in them will change during the course of the application. In addition, the signals are sent between a TXS unit and a QDS unit (H1) or between two TXS processing units (L2) at each cycle, making the network load constant.

Separate Send and Receive channels

Topical Report EMF-2110(NP), Section 2.9.3 describes the Ethernet communication in TXS-based architecture. Topical Report EMF-2110(NP), Figure 2.20 shows the communication between the function processor via the communication processor and the QDS. Topical Report EMF-2110(NP), Section 2.9.2 describes the Profibus communication in TXS-based architecture. Topical Report EMF-2110(NP), Figure 2.18 shows the interference-free L2 communication between two function processors.

Topical Report EMF-2110(NP), Figure 2.18 and Figure 2.20 show that sending packets on the network is independent from receiving packets. Both protocols use full-duplex communication, allowing reception and emission without collision on the same link.

Point-to-Point connection

In the U.S. EPR architecture, every Ethernet connection using the TXS protocol for safety-related applications is point-to-point. Packets are only sent to dedicated receivers by the expected senders. The protocol is at the hardware level and uses the physical addresses of the network components (MAC addresses) to check the consistency between the sender and receiver. Those addresses are set in the applications and will only be changed if the hardware changes.

Using point-to-point connection, without interference on the links, verifies that the response time between sending a message and its reception is predictable and will only change if the link is physically altered. In this case, a regular response time with the Ethernet network exists.

Token passing

According to the token passing principle, when receiving the token, the Profibus module starts an automatic polling to recognize that new messages are stored in its dual-port RAM. The SINEC L2 communication control works autonomously without influencing the strictly cyclic processing of the linked processor systems.

The token passing principle verifies that only one communication processing is sending information on the network to prevent collision.

FSAR Impact:

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

Table 07.09-61-1—Deterministic Network Elements

Element	Profibus L2	Ethernet H1
Cyclic processing	X	X
Static Memory Allocation	X	X
Separate Send and Receive Channel	X	X
Point-to-Point connection		X
Token passing	X	

Question 07.09-63

Clarify statements made in Technical Report ANP-10309P regarding the potential modification to the general network concepts and diagrams described in this technical report.

10 CFR 52.47(a)(2) requires that the design certification application must include a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefore, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished. Section 6 of Technical Report ANP-10309P provides a description of the communications network topology within the U.S. EPR PS. Figure 6-3 through Figure 6-19 of this technical report depicts the network architecture within the PS architecture, implemented using individual point-to-point and ring networks. These figures are designated proprietary. The technical report states that these represent the intended PS network design. These figures are provided to assist in understanding general network concepts described in this technical report, but are subject to modification during the U.S. EPR detailed design process. The staff requested the applicant to clarify how the general network concepts described in this technical report may be modified.

Response to Question 07.09-63

AREVA NP maintains the U.S EPR design commitments regarding the general network concepts detailed in Technical Report ANP-10309P, Section 6.1. The protection system (PS) will implement the general network concepts detailed in Technical Report ANP-10309P.

The communications network topology shown in Technical Report ANP-10309P, Figures 6-3 to 6-19 may be revised because Teleperm XS (TXS) technology continues to evolve. For example, the communications network topology may be revised due to a change in the number of communication ports for each TXS communication module. This communication module is currently shown with two ports in Technical Report ANP-10309P, Figures 6-3 to 6-19. The number of communication ports may increase as TXS technology evolves. A future TXS communication module could be developed with three or four communication ports. This hardware change will result in a modification of the communications network topology detailed in Technical Report ANP-10309P, Figures 6-3 to 6-19.

FSAR Impact:

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