

From: Getachew Tesfaye
To: DAFLUCAS Ronda M.
Date: 5/17/2007 8:26:31 AM
Subject: Draft RAI - Digital Protection System Topical Report
(ANP-10281P)

Ronda,
Attached please find draft RAIs for the Digital Protection System Topical Report (ANP-10281P). We will have our technical staff available to discuss them with you as soon as you are ready. Please call me with a proposed date and time for the telecon.

Thanks,
Getachew Tesfaye
Project Manager
NRO/DNRL/NAR1

CC: Norbert Carte

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DRAFT

REQUEST FOR ADDITIONAL INFORMATION (RAI)

ANP-10281P, "U.S. EPR Digital Protection System" (TAC NO. MD3971)

PROJECT NUMBER 733

- RAI 1) Please identify the portions of ANP-10281P, "U.S. EPR Digital Protection System Topical Report" (PS) that are "sense and command features" as defined in IEEE Std 603-1991.

Federal Regulations, 10 CFR 50.55a(h)(3), require that safety system must meet the requirements of IEEE Std. 603-1991, including the correction sheet dated January 30, 1995. IEEE 603-1991 Section 6, "Sense and Command Features- Functional and Design Requirements", contains requirements for the Sense and Command Features. AREVA must have an idea of which components correspond to these features.

IEEE 603-1991 defines: "**sense and command features.** The electrical and mechanical components and interconnections involved in generating those signals associated directly or indirectly with the safety functions: The scope of the sense and command features extends from the measured process variables to the execute features input terminals."

Section 11.1 of the PS Topical Report says: " * * * the PAC module prioritizes the various sense and command inputs and executes an output that reflects the plant licensing requirements and operational preferences." This seems to imply that the entire digital protection system, as described in the subject topical report, is part of the sense and command features and does not contain any execute features. Is this correct?

Section 14.20 of the PS says: "The sense and command features present in the PS satisfy the requirements of Clause 5 and the requirements of Clause 6 as described below." However, this topical report does not explicitly describe what set of equipment constitute the Sense and Command Features.

- RAI 2) Please identify the execute features associated with the Digital Protection System.

Federal Regulations, 10 CFR 50.55a(h)(3), require that safety system must meet the requirements of IEEE Std. 603-1991, including the correction sheet dated January 30, 1995. IEEE 603-1991 Section 7, "Execute Features- Functional and Design Requirements", contains requirements for the Execute Features. AREVA must have an idea of which components correspond to these features.

IEEE 603-1991 defines: "**execute features.** The electrical and mechanical equipment and interconnections that perform a function, associated directly or

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indirectly with a safety function, upon receipt of a signal from the sense and command features. The scope of the execute features extends from the sense and command features output to and including the actuated equipment-to-process coupling. NOTE: In some instances, protective actions may be performed by execute features that respond directly to the process conditions (for example, check valves, self-actuating relief valves).”

Section 11.1 of the PS Topical Report says: “* * * the PAC module prioritizes the various sense and command inputs and executes an output that reflects the plant licensing requirements and operational preferences.” This seems to imply that the Priority Actuation and Control System (PACS), is part of the execute features. Is this correct?

Section 14.30 of the PS says: “The execute features associated with the PS are capable of receiving and acting upon the automatic actuation signals generated by the PS consistent with the design bases of the system.” This quote is understood to mean that execute features are not part of the Digital Protection System, since the words “associated with” are used rather than “of”.

If the execute features are not part of the PS, then Sections 14.29 through 14.34 are asserting that equipment not described in this report are in compliance with regulatory requirements. No references to what this equipment is, or where it is described are provided. Note: LIC-500; “Processing Requests for Reviews of Topical Reports,” documents that the NRC, through its website (Reference 1), provides guidance to applicants on the NRC’s topical report (TR) program. Both the website (Reference 1) and LIC-500 (Reference 3) state that the report should contain complete and detailed information on the specific subject presented.

RAI 3) Please describe any features that support surveillance testing, and how surveillance testing will be addressed.

RAI 4) Please identify when the Digital Protection System design will be completed.

The Abstract of the PS says: “This topical report describes the design of the U.S. EPR protection system * * *.” However, Section 6.1 of the PS says: “The detailed system architecture is represented through a series of figures (Figure 6-3–Figure 6-20) showing network connections between the different units of the PS [i.e. the Protection System]. These figures represent the conceptual system design and may be modified in the detailed system design phases.” Therefore it is not clear as to whether AREVA considers the design presented to be a design or a conceptual system design. Furthermore, the Abstract of the PS says: “This report describes * * * the typical implementation of protective functions within this architecture.”

Section 4.1 of the PS says: “The networks shown in Figure 4-1 are intended to represent functional connections only, and are not representative of the detailed network topologies as implemented.”

Since no specific inputs or outputs are identified, and only conceptual functionality is defined (i.e. Protection System & Engineered Safety Features Actuation). The design presented is understood to be a conceptual design of the architecture.

Note 1: NUREG-0800 Rev. 5, Chapter 7, Branch Technical Position (BTP) 7-21, "Guidance on Digital Computer Real Time Performance," says: "The level of detail in the architectural description should be sufficient that the Staff can determine the number of message delays and computational delays interposed between the sensor and the actuator. An allocation of time delays to elements of the system and software architecture should be available. In initial design phases (e.g., at the point of design certification application), an estimated allocation of time delays to elements of the proposed architecture should be available."

Note 2: LIC-500 documents that the NRC, through its website (Reference 1), provides guidance to applicants on the NRC's topical report (TR) program. Both the website (Reference 1) and LIC-500 (Reference 3) state that the report should contain complete and detailed information on the specific subject presented. LIC-500 says: "The review of TRs, for the most part, follows the guidance for reviewing license amendments in Office Instruction LIC-101, "License Amendment Review Procedures" (Reference 2)." Section 4.1.1 of LIC-500 says: "(3) * * * Conceptual or incomplete preliminary information will not be reviewed." In addition, Section 2.3.4 of the TELEPERM XS (TXS) Topical Report (TR) (ML003732662) says: "For hardware architecture, application-specific descriptions will be compiled."

RAI 5) Please identify when other concepts will be finalized.

Section 1.0 of the PS says: "AREVA NP requests NRC approval of the following aspects * * * Typical RT concepts * * * Typical ESFAS concepts * * *" However, Section 4.1.1 of LIC-500 says: "(3) * * * Conceptual * * * information will not be reviewed." In addition, Section 2.3.4 of the TELEPERM XS (TXS) Topical Report (TR) (ML003732662) says: "For hardware architecture, application-specific descriptions will be compiled."

RAI 6) Please describe the safety classification of all components and connections shown in Figure 8-4.

Figure 8-4 shows a feedback path from the Priority Actuation and Control (PAC) module to Class 1E logic. The use of the term "1E" implies that this is a safety system. Is this correct? Are all parts of this feedback path through safety system components? Please identify where, in the PAC module Topical Report, the "1E" feedback signals are described.

RAI 7) Please describe AREVA's understanding of the "generic approval" of the TELEPERM XS (TXS) platform as it applies to changes and associated review requirements.

The Abstract of the PS TR says: "The TELEPERM XS platform has been generically approved by the U.S. Nuclear Regulatory Commission for use in safety-related instrumentation and control applications in the United States." In addition Section 15.0 says: "Second generation hardware is currently in development following the established TXS design principles, including qualification and testing methods, and is expected to operate in the same reliable manner." Furthermore, Section 2.1 says: "The generic approval of the TXS system design principles and methods eliminates the need for regulatory review of each individual TXS hardware or software upgrade."

Instead, each applicant must demonstrate that the equipment and software used in the as-built system adheres to the approved TXS design principles and methods.” However, a statement to this effect has not been found in the TXS SER, or in the TXS TR. Generic use of specific versions of specific equipment was provided in the SER. AREVA must realize that certain vendors have an NRC approved QA program, and this programmatic approval does not mean that all designs produced under these program do not require NRC review, nor that the NRC review of items produce would only be to ensure that they followed their QA program. Therefore AREVA’s understanding of the review requirements for the I&C equipment that will be used on the U.S. EPR is unclear. What is planned to be submitted for review, and when?

Section 1.0 of the PS says: “AREVA NP is not requesting approval for a specific set of TXS hardware components or version of the software to be used in the PS.” Therefore any approval of the PS TR will be, qualified in that specific versions of equipment and software will need to be identified, and those versions must be acceptable to the NRC. The NRC will need to decide if this qualification will be in the form of an open item to the SER, COL Action Item, or an ITAAC. This decision will be based on the anticipated timing of the submitted material.

RAI 8) Please describe all of the changes to “design principles and methods” described in the TXS TR.

Siemens submitted a Topical Report (TR) on a Digital Reactor Protection System (ML003732662), and the NRC reviewed and approved that TR (i.e. the TXS TR). Subsequently Areva submitted the subject TR on the Digital Protections System (PS). The PS TR references the TXS TR. It is not clear if the only similarities between the two TRs are those that are referenced in the PS TR. It is also not clear, what all of the differences between these two TRs are. If there are a small number of differences, then it may be quicker to review just the differences, and the affect that these differences have on the approved material. Furthermore, the PS TR, Section 2.1, says: “The generic approval of the TXS system design principles and methods eliminates the need for regulatory review of each individual TXS hardware or software upgrade. Instead, each applicant must demonstrate that the equipment and software used in the as-built system adheres to the approved TXS design principles and methods.” In what ways are the “design principles and methods” that will be used on the application development, different that what was approved? In what ways are the “design principles and methods” that are being used on the platform development, different that what was approved?

RAI 9) Please describe any changes in terminology between the TXS TR and the PS TR.

The PS TR seems to use the term “function computer” in the same way that the TXS TR uses “function processor”. Please identify any other changes in terminology.

RAI 10) For each reference to the TXS TR, please identify the specific passage being referenced.

RAI 11) Please identify where in the NRC’s safety evaluation of the TXS platform, approval of the design principles and methods was explicitly stated.

Section 2.1 of the PS says: "The NRC's approval of the TXS platform as a qualified, generic digital I&C platform also constitutes approval of the TXS system design principles and methods for safety-related applications that were documented * * *."

RAI 12) Figure 4-1: Is the connection to the PAC a hardwired or a buss connection? Why are the connections to the PACs shown as links to another division?

RAI 13) Please clarify the use of the terms "TELEPERM XS" and "TXS."

It is understood that within Areva, the terms "TELEPERM XS" and "TXS" refer to a family of components. Please list all of the components that Areva currently considers to be part of the TXS family.

It is understood that TXS platform described in the Siemens Topical Report EMF-2110, was a subset of the TXS family described above. It is also understood that the NRC review and approval was for specific versions of each component in this platform. Please list all of the component types, and specific versions, that were reviewed as part of the safety evaluation.

It is understood that the TXS family of components could change. That is to say: 1) More components could be added. 2) Some components may no longer be supported. 3) Existing components could be revised.

It is understood that the TXS components that AREVA intends for nuclear application may not be identical to those approved in the Siemens topical report. However AREVA has not identified the specific components or version that will be used.

It is not clear when the terms "TELEPERM XS" or "TXS" are used, if reference is being made to the family of components, or to specific versions of the specific set of components approved by the NRC.

RAI 14) Please list all of the tools that are part of SPACE.

Note: NUREG-0800, Revision 5, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," says: "Methods/tools - It is important to remember that if the output of any tool can not be proven to be correct, such as may occur if the tool produces machine language software code, the tool itself should be developed or dedicated as safety-related, with all the attendant requirements."

References

1. <http://www.nrc.gov/what-we-do/regulatory/licensing/topical-reports.html>
2. Office Instruction LIC-101, "License Amendment Review Procedures" (ML040060258)
3. Office Instruction LIC-500, "Processing Requests for Reviews of Topical Reports" (ML051800651)