

From: Getachew Tesfaye  
Sent: Thursday, March 27, 2008 3:38 PM  
To: Pederson Ronda M (AREVA NP INC)  
Cc: Michael Canova; Eugene Eagle; Terry Jackson; Joseph Colaccino  
Subject: Draft RAI-3 AV42 Priority Module Topical Report (ANP 10273P)  
Attachments: Draft RAI-3 ANP-10273P AV42 TR.doc

Ronda,  
Attached please find draft third round of RAIs for AV42 Priority Module Topical Report (ANP 10273P). We will discuss these RAIs during our upcoming meeting on April 16, 2008.

Please 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,  
Getachew Tesfaye  
Sr. Project Manager  
NRO/DNRL/NARP

Internet Headers:

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From: Getachew Tesfaye <Getachew.Tesfaye@nrc.gov>  
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**DRAFT**

**THIRD REQUEST FOR ADDITIONAL INFORMATION (RAI)**

**ANP-10273P, "AV42 PRIORITY ACTUATION AND CONTROL**

**MODULE TOPICAL REPORT" (TAC NO. MD3867)**

**PROJECT NUMBER 733**

(Based on Discussions between NRC and AREVA NP on March 06, 2008)

RAI-60. Provide the total number of pins on the Programmable Logic Device (PLD), the number of those pins used as inputs and outputs, the number of those pins that are unused, and the number of internal states (i.e., memory/flip-flops) in the PLD.

RAI-61. Provide further description and details that demonstrating how the testing performed on the AV42 achieves the same results as described by the Communications interim staff guidance.

Topical Report ANP-10273P and previous RAI responses imply that the AV42 has been 100 percent tested. However, the testing as described in RAI-29 is described as decomposition testing of sub-functions that had little interaction with each other. DI&C-ISG-04, "Highly Integrated Control Rooms – Communications Issues," Section 2, describes 100 percent testing, as intended by the interim staff guidance, to mean that every possible combination of inputs and every possible sequence of device states is tested, and all outputs are verified for every case. In order to verify that the testing performed on the AV42 meets the same objective of the 100 percent testing described in the interim staff guidance, the staff would need a comparison of the AV42 testing to the testing described in the interim staff guidance, and the basis for why any differences between the two testing methods would meet the intent of the interim staff guidance (i.e., demonstration of error-free software).

RAI-62. If there are unused pins on the PLD, describe how they are treated (i.e. tied to logic TRUE or FALSE) and describe how it is accomplished.

DI&C-ISG-04, "Highly Integrated Control Rooms – Communications Issues," Section 2, recommends that any unused inputs on the PLD should be forced to either "TRUE" or "FALSE" and then can be ignored in the "all possible combinations" testing. The concern is that unused pins, if not at a known logic level, could potentially affect the logic on the device through a sneak circuit.

RAI-63. Make available for viewing the test reports (i.e., the tests reported by EPRI, Sandia, and others) that provided evidence to support the AV42 NP's claim that the AV42 is qualified to operate in environments up to  $10^4$  rad (100 Gy). Provide

on the docket (as proprietary, if required) AREVA NP Document 51-5052273-00, "TXS Radiation Qualification."

The basis for this assertion is an analysis and a review of test reports rather than specific experimentation. According to AVERA NP, equipment tests by EPRI, Sandia Labs, and others, indicate nearly all types of electronic equipment, including components that make up the AV42 module, were deemed capable of withstanding at least an order of magnitude more radiation exposure than the normal accepted limit before performance degradation becomes a concern (see EPRI TR-107330

RAI-64. Provide on the docket (as proprietary, if required) AREVA NP Summary Test Report 66-5065211-00, "Surveillance and Functional Test Report for Additional Equipment."

Topical Report ANP-10273P, Section 6.4., "Seismic," states that environmental and seismic qualification testing was performed in accordance with IEEE Std 344 and EPRI TR-107330. Further, that the seismic and environmental test results are documented in AREVA NP Summary Test Report 66-5065211-00. During the NRC visit to AREVA NP in September, 2007, NRC had the opportunity to briefly review the temperature and humidity test results. However, time did not allow a review of the seismic tests. The safety evaluation report (SER) will need to address environmental bounding conditions for the application of the AV42.

RAI-65. Is it intended to have a boundary lower limit of 40°F on the use of the AV42, or is there a different value?

Topical Report ANP-10273P, Section 6.2, stated that the specified AV42 operating temperature range is 0–55°C (32–131°F). However, it also stated that the temperature range for operability testing of the AV42 is ambient 4.4 to 60°C (40 – 140°F) over a relative humidity range of 5 to 90 percent. This minimum of 40°F seems rather high (for a lower limit) considering the potential need for the use of AV42 in some systems as in service water systems where the control centers could go slightly below this temperature in winter months.

RAI-66. **QUESTION RAI-66:** Explain the procedures, methods, and analysis used in determining the predicted Mean Time Between Failure (MTBF) in years and provide on the docket (as proprietary, if required) the references that the predicted MTBF quoted are based on.

AREVA NP showed documentation to indicate that at 40°C (104°F), the predicted MTBF for the AV42 is 127 years. At 35°C (95°F), the predicted MTBF is 285 years. For the SER to be able to refer to or quote such data that would

significantly support the quality requirements, the staff needs reasonable assurance of the probable accuracy of these predictions.

- RAI-67. Provide an adjusted description of the prioritization scheme for inputs into a proprietary part and non-proprietary part, or revise the currently proprietary description.

The description of the prioritization scheme for inputs is currently proprietary, but needs to be publicly available so it can be used in support of important sections of the SER. In the RAI-06 response two tables (Tables 06-1 and 06-2) describing the priority logic do not have proprietary marking brackets, while others do have proprietary marking brackets (Tables 06-3 and 06-4).

- RAI-68. Provide an adjusted description of the communication isolation between safety and non-safety components into a proprietary part and non-proprietary part, or revise the currently proprietary description such that the non-proprietary part is sufficient for use in the SER.

Part of the description that shows how the AV42 addresses the communication isolation requirement between safety and non-safety is proprietary. It needs to be publicly available so it can be used in support of important sections of the SER concerning interim staff guidance and meeting IEEE Standard 603 –1991.

- RAI-69. Provide an adjusted description of the automatic testing on the priority module into a proprietary part and non-proprietary part, or revise the currently proprietary description such that the non-proprietary part is sufficient for use in the SER.

Part of the description that shows how the AV42 addresses automatic testing on the priority module is marked proprietary. It needs to be publicly available so it can be used in support of important sections of the SER. Primarily, there is a need to describe how it will not interfere with the safety function.

- RAI-70. Describe in detail the procedures and methods used to address manual verification of automatic testing.

DI&C-ISG-04, "Highly Integrated Control Rooms – Communications Issues," Section 2, calls for manual verification of automatic testing.

- RAI-71. What technical aspects does the German standard KTA 3503 cover in relationship to the AV42?

The standard KTA 3503 was mentioned in the AVERA NP topical report ANP-10273P as one of quality standards that involve safety requirements that the AV42 satisfied.

RAI-72. Identify the mapping of the 64-pin connector on the back of the AV42 card to the pins of the PLD.

The response to RAI-03 defined each of the inputs/outputs on the backplane associated with the 64-pin connector (not Profibus data communications). Further, the response indicated that if a parameterization pin needs to be set to a "1" it will be wired to 24 volts DC; if it needs to be set to a "0," it will be left unconnected. Internal pull-down resistors will force an unconnected pin to a "0." However, it is not clear how some of the 64-pin connector lines map to the PLD or the rest of the AV42 card.

RAI-73. Provide on the docket (as proprietary, if required) TUEV reports 968K 102.02/02 and 968K 102.05/03 that describe the AV42 testing.

Topical Report ANP-10273P referenced these as basis for claims of the AV42 satisfying quality guidance, regulation, and standards. The staff needs sufficient and continued access to these as significant references that support conclusions on the AV42 for the SER.

RAI-74. Provide a copy of the data sheet for the PLD used that includes the pin diagram and description for the PLD.

RAI-75. Provide on the docket (as proprietary) AREVA NP Document No. 01-1007841-00 (associated with the hardware environmental testing of the AV42).

The staff needs sufficient and continued access to this to have a reasonable assurance of the quality of the AV42 to be able to complete the SER.

RAI-76. Provide on the docket (as proprietary) the test plan, test results, and test reports, not already requested, that support the logic testing of the PLD.

The staff will use these documents to evaluate the sufficiency of the testing performed on the AV42.

RAI-77. Is there any condition when the test signal is present that could delay a safety signal output (by up to 5 seconds), when a safety signal suddenly appears during the test or the module get stalled in a test state?

Topical Report ANP-10273P and RAI responses indicate that when a test signal is present, a safety signal input will still have priority and the required output be executed immediately. Further stated, if a test signal is present more than 5 seconds, the test signal will be aborted. The staff is concerned about any condition that might delay the safety function execution by up to the 5 seconds or stall the safety function.

RAI-78. Provide a summary of the operating experience with the AV42 module in actual plant use, and specially nuclear power plant use, which can be quoted by the staff in the SER.

Actual successful operating experience should be an important item that supports verification of a quality development, production, verification, and testing process in the SER.