April 30, 2008

Mr. Ronnie L. Gardner
AREVA NP Inc.
3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

SUBJECT: AREVA NP, INC. - THIRD REQUEST FOR ADDITIONAL INFORMATION REGARDING ANP-10273P, "AV42 PRIORITY ACTUATION AND CONTROL MODULE TOPICAL REPORT" (TAC NO. MD3867)

Dear Mr. Gardner:

By letter dated November 28, 2006, AREVA NP, Inc. (AREVA) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review, ANP-10273P, "AV42 Priority Actuation and Control Module Topical Report [TR]." In the acceptance letter to review the TR, the NRC staff stated its expectation to issue any requests for additional information (RAIs) by July 31, 2007. However, the possibility of issuing RAIs beyond our original estimated date was communicated to you verbally and in the letters that transmitted the first two sets of RAIs.

The NRC staff continues to review your submittal and has determined that additional information is required in order to complete the review. The RAIs are contained in the enclosure to this letter. A draft of the RAIs was provided to you on March 27, 2008 (ML081000370), and discussed with your staff during a public meeting held on April 16, 2008. As a result of that discussion the staff has modified some of the requests and identified additional ones that it needs to complete it is review. Your staff has agreed that your response would be provided within 60 days of the date of this letter.

If you have any questions regarding this matter, I may be reached at 301-415-3361.

Sincerely,

/RA/

Getachew Tesfaye, Sr. Project Manager
EPR Projects Branch
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-020

Enclosure:
Request for Additional Information

cc: See next page

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Project No. 733

Enclosure: Request for Additional Information
cc: See next page

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THIRD REQUEST FOR ADDITIONAL INFORMATION (RAI)

ANP-10273P, "AV42 PRIORITY ACTUATION AND CONTROL

MODULE TOPICAL REPORT" (TAC NO. MD3867)

PROJECT NUMBER 733

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 subfunctions 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 AVERA 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. 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.

RAI-79. Explain how the SFEN works to block certain commands including any effect on the hardwired inputs to the PLD from the Main Control Room (MCR) or Remote Shutdown Station (RSS) and any effect on safety commands either automatic or manual.

The response to RAI-03 defined the SFEN states and RAI-35 provided further information, but the response left some unanswered concerns about safety system actuation.

RAI-80. Explain the connection and interaction between the PLD and the watchdog timer output from the PLD.

The response to RAI-08 provided information on watchdog timers, however the discussions of April 16, 2008 indicated that additional interactions with the PLD had not been identified by the RAI response that left some unanswered concerns.

RAI-81. Explain the effect of a watchdog timer reset if a command (for a safety command, for a non-safety command) is in progress, but not completed.

The concern is to make sure that a safety command actuation will go to completion as directed by IEEE Std. 603-1991 and that a non-safety command does not interfere with the safety command as a result of a sudden watchdog timer reset action.

RAI-82. Explain what types of information (i.e. programs, runtime parameter types, passwords, etc. rather than exact individual items) are stored in the non-volatile memory of the microprocessor verses what types of information are read from the back-plane connector parameters and what, if any, information is uploaded into RAM or "runtime memory" on initialization or network initialization.

As part of the verification that the non-safety portion will not interfere with the safety function, a clear understanding is needed on what the microprocessor depends upon when it validates a network message received and any susceptibility of the designed, approved, and tested microprocessor program being changed by any run-time network action.

RAI-83. What happens if a cyclic command network message, coming into the microprocessor, suddenly stops before the command is actually completed?

As part of the verification of that the non-safety portion will not interfere with the safety function, a clear understanding and assurance is needed that even if the microprocessor program locks up or is in a "long wait", the safety function can be performed.

RAI-84. Explain the how, during the testing of the AV42, the arrival of a real safety command is able to be executed (related to a round 3 RAI above, but a specific aspect of concern) regardless of the presents of the test signal even before a test signal timeout,

IEEE Std. 603-1991 has requirements on testing on modules in safety systems. The RAI responses indicated that even if an external test signal is present and an actual safety function is required, the safety command will be executed even before the test signal time-out (i.e. no significant delay). The impression was that this was a function within the AV42. However, discussion in the April 16 meeting indicates this important safety factor is more dependent on <u>both</u> the AV42 and external actions and needs to be clearly explained.

RAI-85. When the AV42 is initially powered up, what state do the non-basic logic components (registers, flip-flops, etc, if any) take and how are these verified to be correct during initial AV42 component and/or module test at the factory? Upon initial power-up of the AV42, will the status of the non-logic components reflect, or need to reflect, the status of various actuation devices that the AV42 may control?

Again, the regulations require a quality product. This means understanding the basic operations and testing of the AV42.

RAI-86. Explain how AREVA NP will handle the plant specific design controls for the AV42 to assure that the installed priority modules will still meet the safety requirements, i.e. providing guidance for training, installation, testing, and operation as well as any planned AREVA NP designer/developer review that the proposed plant specific designs meet specification.

The topical report, RAI responses, and discussions with AREVA NP indicate back plane parameter selection, programming, and application of the AV42 is very dependent on the plant-specific equipment and safety system design.

RAI-87. Describe how the AV42 meets the independence requirements of Clause 5.6.3 in IEEE 603-1991.

Section 4 of the topical report discusses non-safety to safety related communications in the AV42. Specifically, AREVA identified the Profibus controller as non-safety related, but equipment qualified to Class 1E standards. Responses to RAIs provided additional information to this subject. However, it needs to be made clear in the topical report as to conformance to Clause 5.6.3 of IEEE 603-1991. For example, if the Profibus controller is non-safety related, is it an associated circuit? If so, address how it meets the definition of an associated circuit and how it meets the guidance in Section 5.5 of IEEE 384-1981.

RAI-88. AREVANP document 51-5052273 references FANP 51-5055032-00, "Teleperm XS Functional Test Procedure for TXS and Support Equipment In accordance with EPRI 107330.000 and TR102323." Please submit this document for NRC review and reference, appropriately identified as proprietary if necessary, in line with the requirements for documents submitted under the Topical Report review procedures.