May 15, 2008

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

SUBJECT: SECOND REQUEST FOR ADDITIONAL INFORMATION REGARDING ANP-10278P, "U.S. EPR REALISTIC LARGE BREAK LOSS OF COOLANT ACCIDENT TOPICAL REPORT" (TAC NO. MD4978)

Dear Mr. Gardner:

By letter dated March 26, 2007 (ML070880732), AREVA NP (AREVA) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review Topical Report (TR) ANP-10278P, Revision 0, "U.S. EPR Realistic Large Break Loss-of-Coolant Accident Topical Report" [ML070880739 (proprietary) and ML070880737 (non-proprietary)]. In the acceptance letter to review the TR, the NRC staff stated its expectation to issue any requests for additional information (RAIs) by July 27, 2007. However, the possibility of issuing RAIs beyond our original estimated date was communicated to you verbally and in the acceptance letter.

The NRC staff continues to review your submittal and has determined that additional information is required in order to complete the review. A draft of the RAI was provided to you on May 8, 2008 (ML081300757), and discussed with your staff on May 9, 2008. No changes were made to the draft RAI as a result of that discussion. Your staff has agreed that your response would be provided within 30 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: DC AREVA - EPR Mailing List

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SECOND REQUEST FOR ADDITIONAL INFORMATION (RAI)
ANP-10278P, "U.S. EPR REALISTIC LARGE BREAK LOSS OF COOLANT ACCIDENT TOPICAL REPORT" (TAC NO. MD4978)
DOCKET NO. 52-020

RAI-10. In response to NRC concern that the plant licensing basis LOCA analysis should not be performed at less than the full licensed power level (Reference 1, slide # 40) AREVA indicated that, “The methodology will be changed to eliminate sampling of core power, and that the core power should be held constant throughout the case, set at a value equal to the plant rated power plus the established measurement uncertainty. For the plants that will not incorporate measurement uncertainty reduction, the applied uncertainty should be set at 2%”.

It is noted that the U. S. EPR RLBLOCA Topical Report (Reference 2) is based on EMF- 2103(P)(A) (Reference 1).

Table A-6 (Reference 2, page A-12) summarizes the major parameters for the limiting transient. The core power for the limiting case is 4,570 MWt which is less the plant rated power (4,590 MWt, see Reference 2, Table A-3, page A-7).

Please explain the differences between the AREVA’s position and the Table A-6 results (Reference 2) in regards to representation of core power in the limiting case.

RAI-11. Page 5-3: A statement is made that U.S. EPR accumulators are configured similar to those in current plants. Their design is such that they are not subject to a single failure nor are they allowed out of service for preventive maintenance. Thus, all four accumulators are available for accident mitigation.

Figure 2-3 shows that MHSI, LHSI and one accumulator all enter a cold leg through a common line. If the break to the RCS is to this line (after the check valves), then coolant from the affected MHSI/LHSI, and also the affected accumulator would be lost to the break. Please justify the assumption in Table 3-2 that all four accumulators are available for break areas that are equal to or greater than the accumulator line flow area.

RAI-12. The limiting transient (Table A-8) shows that the PCT occurs coincident with Bottom of Core Recovery at 33.9 sec. Before this time, the core should be heating up nearly adiabatically because of stagnant flow conditions. Please justify this instant reversal in cladding temperature and identify the mechanisms by which S-RELAP cools the PCT location so quickly. Table A-9 for example shows vapor Reynolds number (Re) less than 3000, which would provide a low Nusselt Number (Nu) even if a transition to turbulent flow was assumed to be complete. The liquid Re is also low (Re<1000) according to Table A-9. Show how the assessment for S-RELAP bounds the very high

heat transfer rate as this rapid turn-around implies in spite of these low Re and a low hot assembly mass flux.

For the limiting transient, please provide as a function of time:

a. Upper head pressure
b. Hot Assembly (HA) Inlet Mass Flux and Void Fraction (or alternatively the liquid and vapor phase flow rates
c. HA Liquid and Vapor Temperatures
d. Power Shape assumed
e. Axial Fuel Centerline and Cladding Temperature Profile in HA at BOC.

Provide as a data file with values every 0.1 second.

RAI-13. The AREVA S-RELAP5 model appears to have two different accumulators discharge pipe sizing. Please confirm that the accumulator's piping modeled in the EPR S-RELAP5 model is consistent with the EPR plant design.

RAI-14. Please provide the power shape which is used in the EPR's RLBLOCA model and discuss the methodology that is used in obtaining this power shape. Explain the differences between the power shapes that are used for the RLBLOCA for the operating plants (12 ft fuel) and the EPR design?

RAI-15. Please evaluate the reactor coolant pump status in the broken loop and its impact on PCT. If the RCS pump in the broken loop locks and fails resulting in higher PCT, please justify why the proposed methodology is still applicable.

RAI-16. Please provide information regarding the methodology and the containment model that are used to calculate the containment back pressure during a LBLOCA. Is the methodology approved for the EPR design by the NRC?

RAI-17. Please provide the reference for the Decay Heat Curve that is used in the EPR's RLBLOCA. Please explain the 0.96132 multiplier listed in Table A-6, "Summary of Major Parameters for Limiting Transient."

RAI-18. Please provide the nominal case for the EPR's RLBLOCA at 100% + MUR and 100% DEG break size. Please provide and discuss the choice of the range and the calculated values of all the sampled variables for the proposed 59 cases including the modeling input variables.

RAI-19. Please provide validation of the calculated core inlet, outlet flow and core outlet quality information [such as Figure 15.6-32, Figure 15.6-33, and Figure 15.6-43 (pages15.6-92, 15.6-92, and 15.6-103) of the U.S. EPR Final Safety Analysis Report]. Please demonstrate that the oscillatory core flow predicated by S-RELAP during reflood is supported by experimental data such as the FLECHT experiments predictions.

RAI-20. The S-RELAP calculation for the RLBLOCA indicates a system pressure of about 150 psi during accumulator injection phase. Please explain this phenomenon.

Reference 1: RLBLOCA (EMF-2103(P)(A) Revision 0, Issue Resolution meeting in Rockville, Maryland on 12/12/2007.

Reference 2: ANP-10278P, “U. S. EPR Realistic Large Break LOCA TR Revision 0.

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