January 23, 2017

Mr. Gary Peters, Director
Licensing and Regulatory Affairs
AREVA Inc.
3315 Old Forest Road
Lynchburg, VA 24501

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: AREVA INC. TOPICAL REPORT ANP-10338P, "AREA – ARCADIA ROD EJECTION ACCIDENT" (CAC NO. MF7009)

Dear Mr. Peters:

By letter dated October 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15300A298), AREVA INC. (AREVA) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review and approval Topical Report (TR) ANP-10338P, "AREA – ARCADIA Rod Ejection Accident." Upon review of the information provided, the NRC staff has determined that additional information is needed to complete the review. On December 12, 2016, Jerald Holm, AREVA Product Licensing Manager, and I agreed that the NRC staff will receive the response to the enclosed request for additional information (RAIs) questions by March 31, 2017.

If you have any questions regarding the enclosed RAI questions, please contact me at 301-415-4053.

Sincerely,

/RA/

Jonathan G. Rowley, Project Manager
Licensing Processes Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 728

Enclosure:
RAI Questions

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: AREVA INC. TOPICAL REPORT ANP-10338P, "AREA – ARCADIA ROD EJECTION ACCIDENT" (CAC NO. MF7009) DATED January 23, 2017

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OFFICIAL RECORD COPY:

REQUEST FOR ADDITIONAL INFORMATION

RELATED TO TOPICAL REPORT ANP-10338

"AREA – ARCADIA ROD EJECTION ACCIDENT"

AREVA INC.

(CAC NO. MF7009)

RAI 1:

The ARCADIA Rod Ejection Accident (AREA) analytic methodology consists of a sequence of multi-physics coupled codes. The transient behavior of the computed figures of merit are dependent on the evolution of the state vector that defines, in a consistent manner, the evolution of the values of the state vector components. These allow the computation of integral values of the figures of merit for comparison to the defined regulatory limits.

A. Define the time-dependent state vector (i.e., give the vector components) that is computed by AREA for the calculation of the time behavior of the figures of merit that demonstrate that the regulatory acceptance criteria are met.

B. Elaborate Figure 5-1 so that the flow of the coupling within ARTEMIS and of ARTEMIS/S-RELAP5 is shown clearly as either internal, external, or parallel with regard to the information in the state vector as it flows through the coupled codes.

C. Elaborate in detail the coupling scheme shown in Figure 6-1 by following the components of the state vector over one time step.

    1. Identify the couplings and show whether they are simultaneous or staggered. In particular, is the ARTEMIS/GALILEO one-way or two-way?

    2. How do you assure that the state vector components are converged within a time step? That is, it appears that you are applying an Operator Splitting methodology. In that case, the action of the governing equations on the variables is decomposed into a separate, uncoupled physical description for each part, leading to an inconsistent treatment of the nonlinear terms.

    3. Identify the automatic couplings and the manual couplings in the context of **one** time step. Give the rational for this distinction and the rules for the application.

D. Define a reference case to demonstrate the results of an application of an AREA analysis.

Enclosure

1. Outline the algorithm for the computation of the converged steady state (i.e., initial condition) for a rod ejection analysis of the reference case. Outline the algorithm for the computation of the converged steady state (i.e., initial condition) for a rod ejection analysis of the reference case.

2. Outline the algorithm for the computation of the converged time behavior of the state vector for a rod ejection analysis of the reference case (i.e., of each component of the state vector).