

October 21, 2009

MEMORANDUM TO: Joseph Colaccino, Chief
EPR Projects Branch
Division of New Reactor Licensing
Office of Nuclear Reactors

FROM: Jason B. Carneal, Project Manager */RA/*
EPR Projects Branch
Division of New Reactor Licensing
Office of Nuclear Reactors

SUBJECT: SUMMARY OF THE JULY 8, 2009, PUBLIC MEETING TO DISCUSS
EPR SUMP PERFORMANCE AND DOWNSTREAM EFFECTS

PARTICIPANTS: AREVA NP, INC., NRC STAFF, MEMBERS OF THE PUBLIC

On July 8, 2009, the U.S. Nuclear Regulatory Commission (NRC) held a public meeting at the AREVA NP, Inc., Twinbrook Office, 1700 Rockville Pike, Rockville, MD, with representatives of AREVA NP, Inc. The purpose of the meeting was to continue a series of interactions between NRC staff and AREVA NP on AREVA NP's approach toward addressing requests for additional information (RAI) related to sump performance and downstream effects. In particular, this meeting was focused on the debris generation methodology, strainer head loss testing, chemical and upstream effects, and downstream effects external / in-vessel. The meeting was related to the Technical Report ANP-10293, "U.S. EPR Design Features to address GSI-191," and followed audits with AREVA NP on April 22-23, 2009, and on June 10 and 23, 2009. The meeting agenda is provided as Enclosure 1 and attendees are identified in Enclosure 2.

This meeting summary is available through the Agencywide Documents Access and Management System (ADAMS) Accession Number ML092100287. The presentation materials distributed at the meeting are contained in ADAMS document ML091900403. Documents in ADAMS are available electronically at the NRC's Electronic Reading Room at <http://www.nrc.gov/reading-rm/adams.html>. If you do not have access to ADAMS or have problems accessing the documents located in ADAMS, contact the NRC Public Document Room (PDR) staff at 1-800-397-4209, 301-415-4737, or pdr@nrc.gov.

The meeting was a Category 1 public meeting during which members of the public were invited to provide comment at specific times identified in the agenda. It was decided during the meeting that the entire meeting would be open to the public. The meeting lasted from 1:00 P.M. to 4:15 P.M. A summary of the subjects covered and respective findings is provided in the sections noted below.

The concluding discussion revealed that it is not yet clear how testing results will translate into modifications of the U.S. EPR Final Safety Analysis Report (FSAR). NRC expressed that the application is still insufficient with regard to sump performance and downstream effects. AREVA personnel committed to meeting the present schedule and to respond appropriately to all RAIs with a submission of a revised technical report, RAI responses, and associated FSAR markups on December 18, 2009. NRC staff and AREVA concluded that several periodic

updates on the status of RAI responses, FSAR mark-ups, and testing protocols will be necessary in order to support the current review schedule.

Generation, transportation and accumulation of debris, and head loss testing

In introduction, NRC staff raised the following issues concerning the information provided in the current U.S. EPR FSAR:

1. Debris generation:

Additional information is required on the break selection criteria, the zone of influence (ZOI), and on insulation material and latent and coating debris in order to define the debris source term in a more reliable and accurate manner. In particular, the methodology employed regarding latent debris requires justification.

2. Transport and accumulation:

NRC staff pointed to apparent discrepancies in the docketed correspondence. The U.S. EPR FSAR states that all dislodged material is transported to the in-containment refueling water storage tank (IRWST) and is assumed to accumulate on one strainer, whereas RAI responses indicate that all debris is transported to one strainer except for the debris captured by the retaining basket or settled out in the tank. NRC staff asked the applicant to reconcile the potential conflict between the FSAR and RAI responses, and to define the design basis more precisely regarding these issues. AREVA representatives acknowledged the need for clarification on this issue.

3. Head loss testing:

Justification is needed for the overall approach. A further discussion on this topic was held and is summarized below.

AREVA personnel stated that the debris generation evaluation process and transport methodology will be based on industry guidance in NEI 04-07 "Pressurized Water Reactor Sump Performance Evaluation Methodology." AREVA considers the U.S. EPR design as resulting in a low fiber plant. However, no quantitative limits exist which define a plant as a low fiber plant. In response to a question from NRC, AREVA confirmed that the containment spray system (CSS) is only used in the context of severe accidents.

AREVA explained that a 100 percent debris transport to the trash racks on the heavy floor is used for the U.S. EPR design, and no credit is taken for intervening structures. Settling and holdup of debris as determined by transport analysis is not credited. AREVA personnel claimed that this results in overall conservatism of the design. NRC raised a question on whether it would be possible for debris to block the trash racks. AREVA representatives responded that the penetration rate of the trash rack will be part of future testing.

Strainer head loss testing

NRC staff addressed the following issues: (1) Justification required for items such as apparent non-conservatism of particulate amounts, and non-prototypical fiber amount (for complete listing see RAI 06.02.02-30), (2) Debris sequencing apparently inconsistent with guidance, (3) Head loss not extrapolated out to mission time, (4) Comprehensive demonstration of retaining basket

filtration performance, (5) Demonstration that flow conditions simulated in strainer head loss test flume are prototypical and conservative with respect to plant conditions.

AREVA summarized the path forward on strainer head loss testing and concluded that the testing will demonstrate the effectiveness of the three-tiered design, which consists of protective structures, retaining baskets, and large surface area three-dimensional flat screen sump strainers in the IRWST.

AREVA presented previous tests performed at facilities in Germany and clarified NRC staff questions concerning these tests. Testing was performed for much higher fiber load than expected in U.S. EPR design. Future tests will be performed based on a U.S. EPR specific debris source term and in accordance with the NRC March 2008 guidance. The results of the past tests are not credited with regard to the FSAR which is submitted for the design certification of the U.S. EPR. Future testing will, among other issues, address debris sequencing, chemical precipitant addition, and bypass sampling.

The testing protocol is currently under development, and it was agreed that AREVA will schedule a meeting with NRC staff to review the test methodology and protocols prior to testing.

Chemical and upstream effects

Regarding the upstream effects, NRC staff requested a more thorough discussion of the following FSAR issues:

1. Description of the evaluation approach
2. Specification of debris hold-up volumes
3. Provision of basis for conclusion that water inventory required for ECCS recirculation would not be held up by debris blockage at chokepoints in sump return flow-paths
4. Protection of drain paths such as refueling and reactor cavity drain lines from potential debris blockage

To minimize chemical effects, AREVA expressed the goal to control and limit the use of zinc and aluminum in the containment. Furthermore, no cal-sil insulation will be used in the containment and Reactor Coolant System (RCS), and piping insulation is to be of reflective metal insulation (RMI) type to the extent practicable. For these reasons, AREVA anticipates that chemical effects will be minimal.

AREVA will utilize the NRC-sponsored integrated chemical effects test (ICET) results along with additional testing to specify the chemical precipitants for the containment.

Downstream effects: Ex-vessel and in-vessel evaluation

A. Ex-vessel evaluation:

Downstream effects to ex-core components will be addressed by AREVA through equipment specifications. To provide input to vendor specifications, strainer bypass sampling will be performed. AREVA will specify materials in equipment specifications for fluid debris and mission time that must be qualified by vendors.

NRC staff asked for the evaluation of the methodology and a clear description of the program. NRC staff also inquired whether the appropriate vehicle to be used to ensure

the proposed methodology would be through an inspection, test, analysis, and acceptance criterion (ITAAC). A discussion was held, but no decision was made on this point during the course of this meeting.

B. In-vessel evaluation:

AREVA will perform screen debris bypass testing to determine the in-core source term. Insights from operating plant bypass testing will be used to ensure a conservative source term. The assessment of the effect of debris on the fuel will be done in a similar manner to the current operating plants and will address the following issues: (1) Debris accumulation at the core inlet, (2) Debris accumulation at the intermediate spacer grids, (3) Debris adherence to heated fuel rods, (4) Chemical effects in the reactor vessel (RV) and core, (5) Debris introduced during low head safety injection (LHSI).

The evaluation will be consistent with the operating plant methodology and will include results from tests of AREVA fuel designs. The operating plant methodology is currently under review by NRC and AREVA is involved in this process.

Path forward:

1. Debris generation methodology:

AREVA is currently developing the break selection and debris generation methodology, guided by NEI 04-07 and associated NRC safety evaluation.

2. Strainer head loss testing:

The planned test is scheduled for late September. A preliminary test plan is being prepared (with tests including the thin-bed effect) and the test methodology will be discussed with NRC prior to testing.

NRC points out that the complex design of the U.S. EPR necessitates a complex testing and the optimum scaling of test set-ups might differ for the different foci that are covered by the test plan.

3. Chemical and upstream effects:

AREVA will perform analysis and specification validation testing to identify chemical precipitants. The resulting chemical effects will be included in strainer head loss testing. NRC pointed to the issue of where precipitants form and that further evaluation will be necessary on which insertion location will represent the highest degree of conservatism.

4. Downstream effects:

For ex-vessel downstream effects, AREVA will determine bypass debris and identify mission time. Pertinent requirements will be included in equipment specifications and addressed during component procurement and testing.

For in-vessel downstream effects, the evaluation will be performed using current industry guidelines.

AREVA's commitment is to have all testing done and outstanding RAIs addressed with the revision and submission of ANP-10293, "U.S. EPR Design Features to address GSI-191," by December, 18, 2009. Further interactions with NRC, both of an informative nature and focusing on details of the testing methodology, are planned to foster this approach.

Members of the public were in attendance. No public feedback forms were received. Please direct any inquires concerning this meeting to Jason.Carneal@nrc.gov.

Docket No. 52-020

Enclosures:

(1) Meeting Agenda and (2) Attendee List

cc: EPR DCWG Mailing List

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Docket No. 52-020

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cc: EPR DCWG Mailing List

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REVISED AGENDA

AREVA NP, INC. PUBLIC MEETING

Wednesday July 8, 2009
1:00 PM – 5:00 PM

- | | |
|---|----------------|
| 1:00 P.M. Introduction and Opening Remarks | (NRC/AREVA NP) |
| 1:15 P.M. Baseline Evaluation of Sump Performance | (NRC) |
| 1:45 P.M. Strainer Head Loss Testing /
Debris Generation Methodology | (AREVA NP) |
| 2:30 P.M. BREAK* | |
| 2:45 P.M. Discussion of Chemical and Upstream Effects | (NRC/AREVA NP) |
| 3:30 P.M. Downstream Effects External / In-vessel | (NRC/AREVA NP) |
| 4:00 P.M. Opportunity for Public Comment* | (NRC/AREVA NP) |
| 4:15 P.M. Discussion of Proprietary Issues and Content | (NRC/AREVA NP) |
| 5:00 P.M. Adjourn* | |

All times listed are approximate and for planning purposes only, Adjustments may be made during the meeting as necessary.

**The public will be given the opportunity to comment prior to these points in the meeting.*

**Attendance List
AREVA NP, INC. Public Meeting
July 8, 2009**

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(Revised 04/01/2009)

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