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Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Closure Plan for Issues Associated with GSI-191 for the U.S. EPR Design Certification

Ref. 1: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "Application for Standard Design Certification of the U.S. EPR (Project No. 733), NRC:07:070, December 11, 2007.

Ref. 2: Letter, Ronnie L. Gardner (AREVA NP Inc.) to Document Control Desk (NRC), "U.S. EPR Final Safety Analysis Report, Supplement 1," NRC:08:012, February 7, 2008.

Ref. 3: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "U.S. EPR™ Design Certification Submittal of Revision 1 to Technical Report ANP-10293, 'U.S. EPR Design Features to Address GSI-191'." NRC:10:050, May 19, 2010.

Ref. 4: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "U.S. EPR Design Certification Submittal of Revision 2 to Technical Report ANP-10293, 'U.S. EPR™ Design Features to Address GSI-191'." NRC:10:102, November 5, 2010.

On December 11, 2007, AREVA NP Inc. (AREVA NP) requested the NRC's review and approval of its application for design certification of the U.S. EPR (Reference 1). To support the application, AREVA NP provided technical report ANP-10293, Revision 0, "U.S. EPR™ Design Features to Address GSI-191" (Reference 2). Reference 3 provided a complete revision to the technical report and included the results of additional testing and evaluations. The revision provided in Reference 4 contained additional information regarding the potential effects of debris-laden coolant on sump strainer performance, including an evaluation of in-vessel effects.

To support NRC planning for the completion of the review of issues associated with sump strainer clogging and chemical and downstream effects, AREVA NP committed in Reference 4 to provide a closure plan for resolution of GSI-191 issues for the U.S. EPR. Enclosed with this letter is the closure plan, which includes:

- Summary
- Background
- U.S. EPR design approach to address sump strainer clogging and downstream effects

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- Summary of activities completed, including analytical evaluations and testing
- Resolution plan
  - Engineering activities (analytical and testing)
  - Licensing approach and identification of affected licensing documentation
  - Communication and coordination between AREVA NP and NRC
  - Timeline for conduct of engineering activities and preparation and submittal of updated licensing documentation, with identification of opportunities for NRC interactions.

As noted in Reference 4, AREVA NP will keep the NRC staff informed of progress toward resolution of GSI-191 issues throughout the preparation and submittal of revised documentation. AREVA NP will either provide draft information for discussion prior to submittal of final information or will communicate the nature of changes in advance of submittal of final information.

To ensure timely communication as the closure plan is executed, biweekly GSI-191 telephone calls with the NRC technical staff have been reestablished. In addition, AREVA NP requests a public meeting with NRC staff in mid-January 2011 to confirm the viability of the enclosed closure plan.

If you have any questions related to this information, please me by telephone at (434) 832-2369 or by e-mail at sandra.sloan@areva.com.

Sincerely,

Sandra M. Sloan

Sandra M. Sloan, Manager
New Plants Regulatory Affairs
AREVA NP Inc.

Enclosure

cc: G. Tesfaye
Docket 52-020

AREVA NP Inc.

Closure Plan for GSI-191 Issues

U.S. EPR Design Certification

December 2010

U.S. EPR Design Certification Closure Plan for GSI-191 Issues

Summary

A closure plan has been prepared by AREVA NP Inc. (AREVA NP) to describe the approach to resolve issues associated with sump strainer clogging and chemical and downstream effects for design certification of the U.S. EPR. The closure plan consists of the following sections:

- Background
- U.S. EPR design approach to address sump strainer clogging and downstream effects
- Summary of activities completed, including analytical evaluations and testing
- Resolution plan
  - Engineering activities (analytical and testing)
  - Licensing approach and identification of affected licensing documentation
  - Communication and coordination between AREVA NP and NRC
  - Timeline for conduct of engineering activities and preparation and submittal of updated licensing documentation, with identification of opportunities for NRC interactions

Key activities to be performed include re-evaluation of the debris source term, sump strainer/retaining basket design modification to optimize debris removal, reduction of the debris bypass fraction while maintaining adequate Emergency Core Cooling System (ECCS) pump NPSH margin, and confirmation of the performance characteristics of the modified sump strainer/retaining basket design through testing.

For the U.S. EPR design certification, AREVA NP will request NRC approval of:

- Sump strainer/retaining basket design (as confirmed by large-scale testing)
- Design-specific source term, including chemical precipitates
- Resolution of ECCS Net Positive Suction Head (NPSH) margin
- Resolution of ex-vessel downstream effects
- Testing process and test acceptance criteria for the in-vessel downstream effects evaluation

Ultimate resolution of fuel downstream effects will be addressed by a longer-term initiative. Thus, for design certification, evaluation of in-vessel downstream effects will be the subject of a combined license (COL) information item to be addressed by the COL holder.

In summary, AREVA NP has developed a plan that provides a path for reaching closure on GSI-191 sump strainer design issues in design certification, while establishing a licensing framework for longer-term resolution of in-vessel downstream effects.

Background

Long-term cooling following a loss of coolant accident (LOCA) is a basic safety function for nuclear reactors. The sump recirculation function of the ECCS of a pressurized-water reactor (PWR) provides this safety function. Therefore, success of sump recirculation is necessary for reactor safety and to provide reasonable assurance of adequate protection of public health and safety following a LOCA.

Focused U.S. industry and regulatory activity regarding the adequacy of PWR recirculation sump designs extends back to 1979, when the NRC opened Unresolved Safety Issue (USI) A-43, "Containment Emergency Sump Performance." After conducting an extensive research program, the resolution of USI A-43 was documented in Generic Letter (GL) 85-22, "Potential for Loss of Post-LOCA Recirculation Capability Due to Insulation Debris Blockage." Subsequently, in the 1990's, the NRC issued three Bulletins related to ECCS suction strainer plugging events in boiling-water reactors (BWR): Bulletin 93-02, Supplement 1, "Debris Plugging of Emergency Core Cooling Suction Strainers," Bulletin 95-02, "Unexpected Clogging of a Residual Heat Removal Pump Strainer While Operating in Suppression Pool Cooling Mode," and Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling-Water Reactors."

Findings from research to resolve the BWR strainer clogging issue raised questions concerning the adequacy of PWR sump designs, which prompted the NRC to open Generic Safety Issue (GSI) 191, "Assessment of Debris Accumulation on PWR Sump Performance." The objective of GSI-191 is to ensure that post-accident debris blockage would not impede or prevent the operation of the ECCS and containment spray system in recirculation mode at PWRs during LOCAs or other High Energy Line Break accidents for which sump recirculation is required. After completing the technical assessment of GSI-191, the NRC issued Bulletin 03-01, "Potential Impact of Debris Blockage on Emergency Recirculation during Design-Basis Accidents at Pressurized-Water Reactors" and associated GL 2004-02, of the same title.

The timeline for generic industry and regulatory resolution of in-vessel downstream effects has extended beyond previous expectations. As pointed out in SECY-10-0113, "Closure Options for Generic Safety Issue – 191, Assessment of Debris Accumulation on Pressurized Water Reactor Sump Performance," the timeline for such resolution depends upon the issuance of an NRC Safety Evaluation (SE) on the subject, which was expected to be issued in draft form in September 2010. However, as noted in SECY-10-0113, issuance of the SE may be deferred to await the conclusion of fuel assembly cross-testing. As of the date of this plan, the draft SE has not been issued. As outlined in SECY-10-0113, the industry has presented

to the Commission a plan for operating plants that extends to mid-2012 to provide additional actions, necessary modifications, and timelines on a plant-specific basis.

Separately, but concurrently with on-going industry and regulatory activities, new plant designs such as the U.S. EPR have been developed. Consequently, in contrast with currently operating plants, at the inception of the U.S. EPR design, design features were incorporated to explicitly provide protection against post-accident debris blockage and to provide reasonable assurance of long-term core cooling in compliance with the criterion specified in 10 CFR 50.46(b)(5). These design features are discussed in the next section and are driven by defense-in-depth principles which focus on minimizing the sources of the worst-behaving debris (such as fibrous insulation, calcium silicate, and aluminum) and a multi-tiered approach to physical retention of the materials upstream of the ECCS pumps. These features address the relevant regulatory requirements associated with maintaining adequate NPSH margin and ensuring long-term core cooling.

U.S. EPR Design Approach to Address Sump Strainer Clogging and Downstream Effects

The U.S. EPR sump design is robust with respect to post-accident debris accumulation and ECCS recirculation sump strainer blockage. Debris minimization is accomplished through insulation of the reactor coolant system (RCS) piping and components with reflective metal insulation (RMI), and through removal of fibrous insulation in the zones of influence (ZOI). Calcium-silicate insulation is prohibited in containment. Design features that mitigate the risk of post-accident debris clogging of the ECCS strainers are:

1. A general layout of the plant that reduces the size of the ZOI.

2. The absence of a containment spray system (CSS) for design basis accident mitigation that would contribute to debris transport.

3. RCS insulation materials selected to minimize the quantity of insulation debris known to be highly deleterious to post-LOCA ECCS functions.

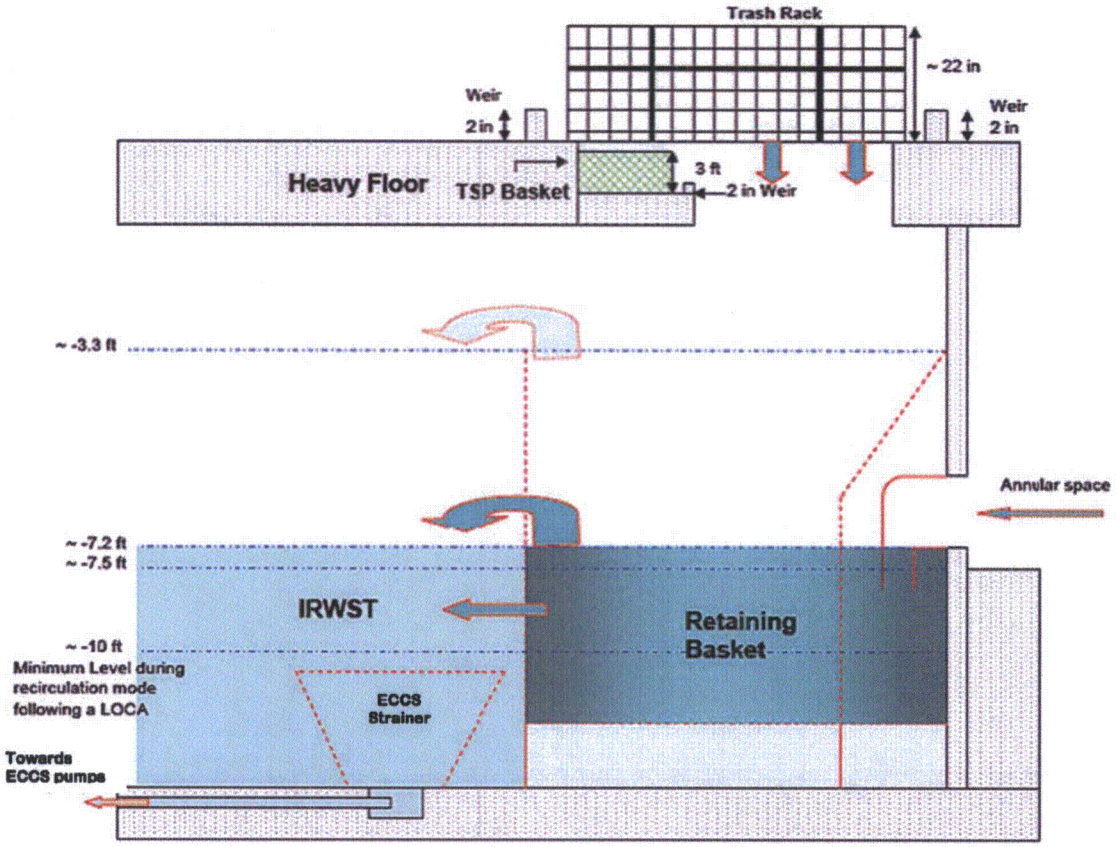
4. Multiple barriers that significantly limit the amount of post-accident debris reaching the ECCS strainers (see Figure 1):
    a. A set of four protective weir/trash rack structures to retain large debris in the RCS loop vault. To facilitate water pooling and debris settling in the RCS loop vault areas, the weir (curb) is approximately 2 inches high.
    b. Trash racks with a 4x4 inch heavy-duty screen that fully encompass the floor openings to prevent large debris from being transported to the In-Containment Refueling Water Storage Tank (IRWST).
    c. Four retaining baskets in the IRWST. A retaining basket is located under each weir/trash rack port to catch and retain any small debris

carried through the trash racks by ECCS recirculation flow. The retaining basket area is sized to overlap the trash rack portal area so that ECCS recirculation flow falls within the retaining basket.

d. Large volume and large area IRWST that results in relatively low flow velocities, permiting settling of fine debris that passes through the retaining baskets.

e. Four large surface area three-dimensional flat screen sump strainers in the IRWST, each protecting one of the four ECCS pump suction sumps located in the floor of the IRWST.

Figure 1. U.S. EPR Sump Debris Retention System



Summary of Activities Completed

AREVA NP has been actively engaged with NRC staff throughout the design certification review to address NRC concerns and resolve issues related to GSI-191, as shown in Table 1. In addition to the interactions listed in Table 1, AREVA NP and the NRC staff held biweekly telecons to facilitate communications.

AREVA NP has performed numerous analytical evaluations and conducted several series of tests (chemistry-autoclave, strainer, and fuel assembly) to address issues related to GSI-191. The evaluations and testing are grouped into four main areas for discussion in this section: debris source term evaluation and debris transport, chemical effects, sump strainer performance testing, and fuel downstream effects testing.

Table 1. Timeline of NRC-AREVA Interactions on GSI-191

Date	Activity
December 11, 2007	Design Certification application submitted
February 7, 2008	ANP-10293 submitted (U.S. EPR Design Features to Address GSI-191 Technical Report)
April 22-23, 2009	NRC audit (design approach and testing)
June 23, 2009	NRC audit (ISO drawings and P&IDs)
July 8, 2009	NRC meeting (plan and schedule for addressing remaining RAIs related to GSI-191)
August 18, 2009	NRC audit (chemical effects testing)
August 21, 2009	NRC audit (calculation files)
September 24, 2009	NRC audit (chemical effects testing)
October 7, 2009	NRC audit (chemical effects test specifications)
October 27, 2009	NRC audit (test plans and protocols for downstream testing and head loss testing)
October 29-30, 2009	NRC observation of in-vessel (fuel) downstream effects testing
November 17, 2009	NRC audit (downstream testing)
November 18, 2009	NRC audit (head loss testing)
Week of November 10, 2009	NRC observation of autoclave testing
November 29 – December 3, 2009	NRC observation of strainer head loss testing (discontinued due to test facility limitations)
December 10, 2009	NRC audit (test protocols)

Table 1. Timeline of NRC-AREVA Interactions on GSI-191

Date	Activity
January 12, 2010	NRC audit (sump strainer/retaining basket structural reports)
January 26, 2010	NRC audit (debris generation calculations)
January 27, 2010	NRC meeting (plan and timeline)
February 22, 2010	NRC observation of sump strainer head loss testing
April 29, 2010	NRC meeting (progress to date, closure path, NRC feedback on tests selected and associated test protocols)
May 19, 2010	Revision 1 of ANP-10293 submitted (with test results)
June 8-10, 2010	NRC audit
July 7, 2010	NRC meeting (NRC feedback on proposed tests and test protocols)
Week of July 26, 2010	NRC observation of sump strainer head loss testing
Week of August 9, 2010	NRC observation of in-vessel (fuel) downstream effects testing
Week of August 9, 2010	NRC observation of sump strainer head loss testing
November 5, 2010	Revision 2 of ANP-10293 submitted (with evaluation of in-vessel effects)

Debris Source Term Evaluation and Debris Transport

A debris generation evaluation was performed to establish the debris source term for the U.S. EPR. The evaluation followed the guidance of Regulatory Guide (RG) 1.82 Rev. 3 and information presented in Nuclear Energy Institute (NEI) guidance document 04-07 and NRC's associated Safety Evaluation. Seven break locations for a postulated LOCA were analyzed, the debris generation totals tabulated for each break, and the limiting breaks identified with respect to the most debris generated. The debris generation totals for the limiting pipe breaks served as a basis for development of the U.S. EPR sump performance evaluation program and validation testing.

Two limiting break locations were identified for the U.S EPR: one in an RCS crossover (cold) leg and one in an RCS hot leg. The limiting cold leg break location produced the most fibrous debris. The limiting hot leg break location produced the most RMI debris. The larger of the debris amounts from each limiting break served as input to the debris source term.

For evaluation of debris transport, it was conservatively assumed that all LOCA related debris is transported to one heavy floor opening (with weir and trash rack) and assumed to enter one retaining basket, even though the U.S. EPR design

incorporates multiple LOCA return flow paths and a tiered defense-in-depth debris retention system. Further, no credit was taken for debris settling prior to entering the retaining basket. Some of the debris entering the retaining basket is filtered by the basket screen and the remainder is transported to one strainer, where it is filtered. The ECCS strainer head loss determination, through testing, is based on the accumulation of debris on a single strainer.

Chemical Effects

Chemical effects were evaluated to identify specific compounds and quantities of materials that may precipitate within the containment sump pool following a LOCA. This evaluation consisted of two parts: chemical effects testing and IRWST sump chemistry modeling.

The chemical effects testing simulated post-break conditions to identify chemical effects arising from the interaction of debris materials and buffering agents used to raise the pH of the fluid in the IRWST. The test results provided the data required to calculate the chemical debris generated as a result of a design basis LOCA in the IRWST sump chemistry modeling study. The IRWST sump chemistry modeling study identified and calculated the specific compounds and quantities of materials that may precipitate within the U.S. EPR reactor containment sump pool following a LOCA.

Sump Strainer Performance Testing

Five types of large-scale, sump strainer tests have been performed:

1. Clean strainer head loss test: to provide a baseline for the other tests
2. Debris transport test: to determine the transport of various types of miscellaneous debris (e.g., RMI and coating chips) through the retaining basket
3. Design basis debris load test: to determine pressure drop across the strainer under design basis debris load conditions
4. Thin bed test: to load the strainer with small batches of debris so as to maximize the head loss by defeating the retaining basket defense
5. Fiber-only bypass test: to quantify the fiber that bypasses the retaining basket and sump strainer

The sump strainer performance test plans contained the debris requirements, flume description with detailed measurements, data recoding methods, test set-up, detailed testing steps, calibration records, and data collected while testing. Testing was performed in accordance with the AREVA NP quality assurance program.

The results of the sump strainer tests are summarized in Table 2. (The tests shown in Table 2 were observed by NRC staff.) The tests demonstrated that the sump debris retention system is effective at preventing significant differential pressure across the strainer; therefore, the required NPSH margin for the safety

injection pumps is maintained. The fiber-only bypass testing showed that, at small fiber batch addition amounts, the fiber bypass fraction is relatively high.

The following conservative assumptions and protocols were used in the strainer testing performed:

- 100% LOCA-related debris introduction into one retaining basket
- No credit taken for weirs or trash rack
- No credit for settling on heavy floor or IRWST floor
- 100% of fiber is characterized as fines
- Addition of paint chips does not take corresponding reduction in paint particulate loading
- Conservative momentum transport from heavy floor into the retaining basket

Fuel Downstream Effects Testing

Four U.S. EPR-specific fuel downstream effects tests have been performed to characterize fuel performance (pressure drop) under various debris load conditions. These tests were performed at a variety of particulate to fiber ratios (p:f), ranging from approximately 27:1 to the most conservative ratio of 1:1. The results demonstrated how pressure drop varies in response to flow conditions and fiber introduction.

The following conservative assumptions and protocols were used in the fuel downstream effects testing:

- Debris continually circulates until captured by fuel assembly
- No credit for settling in the reactor vessel lower plenum
- Debris sequenced in test to generate worst case results
- Tests performed at low temperature
- No boiling simulated
- Uniform flow distribution simulated
- Alternate flow paths not credited
- Extrapolation of single fuel assembly results to the entire core (241 fuel assemblies)
- Thirty day fiber load assumed to be immediately available for introduction into the reactor core

Table 2. Summary of Sump Strainer Test Results

Test No.	Test Type	Date	Strainer dP	Retaining Basket Coverage	Strainer Coverage	Comments
1	Clean strainer head loss	February 2010	N/A	N/A	N/A	
2	Debris transport	February 2010	N/A	N/A	N/A	Demonstrate transportability of particular debris types
3	Bypass	February 2010	None	Fiber Observed	Clear	Invalidated due to retention of fiber in debris introduction pump
3A	Bypass	March 2010	None	Fiber Observed	Clear	Fuel fiber input value
3B	Bypass	August 2010	None	Minimal Fiber	50% Covered	Fuel fiber input value
2	Head Loss	February 2010	None	100% Covered	Minimal	Design basis head loss
4	Thin Bed	February 2010	None	100% Covered	Minimal	
4A	Thin Bed	August 2010	None	Minimal	60% Covered	Small fiber addition batches

Resolution Plan

Based on evaluations and testing performed to date, AREVA NP has concluded that to reach closure on issues related to GSI-191, the following three key items must be addressed:

- The debris source term should be re-evaluated to be more representative (but still conservative),
- The sump strainer/retaining basket design should be modified to reduce the debris bypass fraction, and
- Fuel downstream testing should be continued considering the results of the first two activities.

The first two activities are specifically addressed in this plan for resolution in the design certification review. Resolution of fuel downstream effects issues will be achieved by a longer-term AREVA NP initiative to reach closure outside the context of design certification.

AREVA NP believes this approach is consistent with the NRC staff's position stated in SECY-10-0113, which acknowledged that the sequence of strainer performance issue resolution and issuance of the in-vessel effects SE depends on several factors and will be plant-specific. Further, the defense-in-depth design approach for U.S. EPR sump debris generation and retention, as demonstrated by analytical evaluations and sump strainer testing, provides reasonable assurance that fuel downstream effects as a result of debris bypass will not result in loss of ability to maintain long-term core cooling.

Specific elements of the resolution plan discussed below are:

- Engineering activities (analytical and testing)
- Licensing approach and identification of affected licensing documentation
- Communication and coordination between AREVA NP and NRC
- Timeline for conduct of engineering activities and preparation and submittal of updated licensing documentation, with identification of opportunities for NRC interactions

Engineering Activities

Re-Evaluation of Debris Source Term

The debris source term is being re-evaluated in the following two specific areas.

- Fibrous insulation (previously assumed on piping less than 4 inches in diameter) will be eliminated from the ZOI and replaced with RMI, thereby eliminating a major source of fiber debris. This leaves the remaining fiber source as latent debris.

- The amount of latent and miscellaneous debris will be reduced, from 250 lbs to 150 lbs, based on the design of a separate equipment space inside containment which reduces the surface area that contributes to latent debris.

Other contributors to the debris source term for U.S. EPR will remain as previously reported in AREVA NP technical report ANP-10293, "U.S. EPR™ Design Features to Address GSI-191."

As shown in the timeline in Figure 2, the supporting calculations for the re-evaluation of the debris source term will be available for NRC audit in early January. AREVA NP requests expeditious NRC audit of these calculations, as they provide the basis for the debris source term input for additional sump strainer testing as discussed below.

Modification of Debris Retention System Design

The sump strainer and retaining basket portion of the debris retention system design will be modified to optimize debris removal to reduce the debris bypass fraction while maintaining adequate ECCS pump NPSH margin. Small scale sensitivity studies (tests) are being performed to more accurately characterize the effects of screen material, hole size, percent open area, and flow rate on debris bypass and head loss for the U.S. EPR debris source term. The results of sensitivity studies will be used to identify sump strainer/ retaining basket design changes that will improve (lower) the bypass fraction while maintaining adequate NPSH for the ECCS pumps. These design changes will be limited to the hole size and percent open area and will not include significant changes to the overall sump strainer or retaining basket configuration. (Note that the sensitivity study tests are being performed "for information only" and are not intended to be directly referenced to support design certification.)

Large-scale testing will be performed to confirm performance characteristics (i.e., head loss and bypass fraction) of the modified sump strainer/retaining basket design according to the timeline shown in Figure 2. These head loss and bypass fraction tests will be performed at the large flume facility located at Alden Research Laboratory.

Four large-scale confirmatory tests will be performed for the modified sump strainer/retaining basket design:

- clean strainer head loss test
- design basis debris loading condition test
- thin bed effects test
- fiber-only bypass test

A debris transport test with the modified strainer design will not be performed, since the retaining basket design change will result in the same size or smaller openings and is therefore bounded by prior tests.

The acceptance criterion, associated with NPSH margin, for head loss testing is a strainer head loss less than 2.12 psid. The test results will be used as the basis for the fuel downstream effects testing to address the COL information item.

The NRC staff will be invited to observe the confirmatory testing. Other testing may be performed by AREVA NP as part of facility preparation or for additional data collection.

Licensing Approach and Identification of Affected Licensing Documentation

For U.S. EPR design certification, AREVA NP will request NRC approval of:

- Sump strainer design (as confirmed by large-scale testing)
- Design-specific source term, including chemical precipitates
- Resolution of ECCS NPSH margin
- Resolution of ex-vessel downstream effects
- Testing process and test acceptance criteria for the in-vessel downstream effects evaluation

Resolution of fuel downstream effects issues will be achieved by a longer-term AREVA NP initiative to reach closure outside the context of design certification. Details regarding activities associated with that initiative are outside the scope of this closure plan.

Licensing documentation expected to be affected includes:

- U.S. EPR FSAR Tier 2, Section 6.3
- U.S. EPR FSAR Tier 1, Section 2.2.2
- Sections of ANP-10293, Rev. 2, "U.S. EPR™ Design Features to Address GSI-191 Technical Report"

The types of changes in the FSAR may include the following: modifications to the sump debris retention system information in Tier 2, modified and/or additional Inspections, Tests, Analysis, and Acceptance Criteria (ITAAC), description of testing process and test acceptance criteria for the in-vessel downstream effects evaluation, and a COL information item related to the fuel downstream effects evaluation.

Impacted RAI responses will be identified and communicated to the NRC staff separately, since details of design modifications and test results are needed to comprehensively identify impacted responses.

AREVA NP will keep the NRC staff informed of progress toward resolution of GSI-191 issues throughout the preparation and submittal of revised documentation. AREVA NP will either provide draft information for discussion prior to submittal of final information or will communicate the nature of changes in advance of submittal of final information. Final versions of updated licensing documentation will be submitted to the NRC by March 31, 2011.

Communication and Coordination between AREVA NP and NRC

To efficiently and effectively implement this plan, a number of interactions are proposed between AREVA NP and NRC staff. These interactions should occur at regular intervals and also following completion of certain milestones. AREVA NP will provide opportunities for the NRC staff to audit documents, such as calculations and test procedures as they become available. The objective of these interactions will be to reach agreement on specific actions required for closeout of GSI-191 issues for the U.S. EPR.

AREVA NP is committed to ensuring that activities are well planned, organized and executed. Anticipated activities will be discussed at management and organizational working levels. AREVA NP management will schedule periodic discussions.

AREVA NP will continue to support biweekly teleconferences with NRC technical staff to review progress, identify concerns and formulate additional action plans as necessary.

NRC staff will be invited to observe testing. Associated documentation will be made available for NRC inspection, including the following:

- Re-evaluation of the debris source term
- Sump strainer/retaining basket design evaluations to optimize debris removal to reduce debris bypass fraction while maintaining adequate ECCS pump NPSH margin
- Test protocols and procedures.

A proposed schedule of AREVA NP/NRC interactions is provided in Table 3.

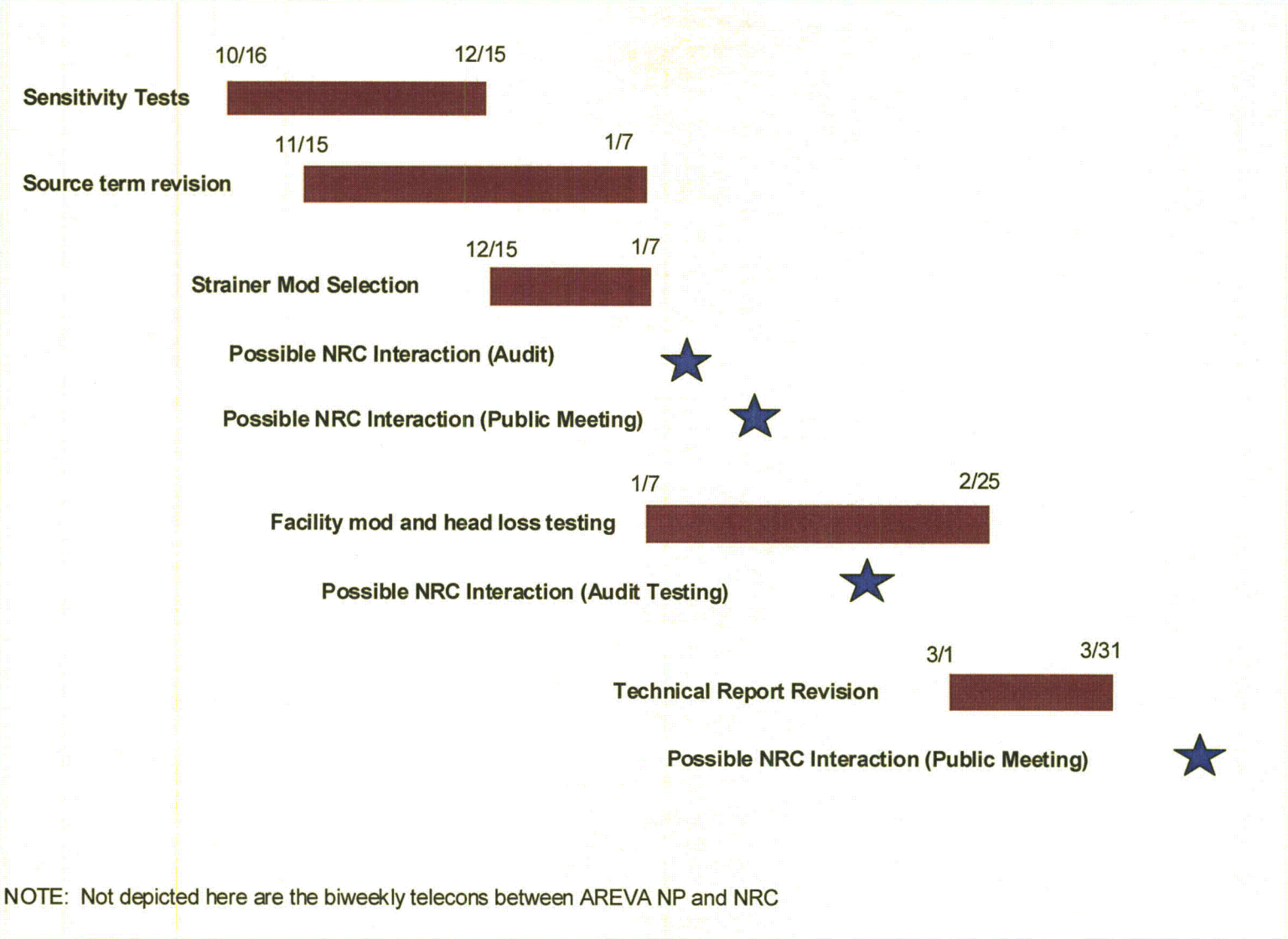
Table 3. Proposed Schedule of Interactions

Date	Interaction
December 16, 2010	Biweekly telecon
January 6, 2011	Biweekly telecon
January 2011	NRC audit: debris calculation
January 2011	NRC audit: sump strainer design change
January 2011	NRC audit: sump strainer test procedure
Mid-January 2011	Public Meeting: Closure Plan
Late January-Early February 2011	NRC observe sump strainer performance testing
February 3, 2011	Biweekly telecon
February 17, 2011	Biweekly telecon
Late February 2011	NRC audit: sump strainer performance test results
March 3, 2011	Biweekly telecon
March 17, 2011	Biweekly telecon
March 31, 2011	AREVA NP submittal of revised Technical Report and other licensing documentation
April 2011	Public Meeting: Status

Timeline

The timeline shown in Figure 2 reflects the activities described in this plan. The timeline takes into account implementation of AREVA NP procedures and processes leading up to formal submittal of revised licensing documentation. It also indicates appropriate opportunities for interaction with NRC staff, such as meetings or audits.

Figure 2. Timeline for U.S. EPR GSI-191 Closure Plan



NOTE: Not depicted here are the biweekly telecons between AREVA NP and NRC