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

Closure Plan for U.S. EPR Instrumentation and Control Communications Independence Issues, Revision 4

- Ref. 1: Letter, Thomas E. Sliva (AREVA NP Inc.) to Document Control Desk (NRC), "Commitment to Provide Closure Plans for U.S. EPR Instrumentation and Control Communications Independence Issues," NRC:10:060, July 1, 2010.
- Ref. 2: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "Closure Plan for U.S. EPR Instrumentation and Control Communications Independence Issues," NRC:10:068, July 28, 2010.
- Ref. 3: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "Closure Plan for U.S. EPR Instrumentation and Control Communications Independence Issues, Revision 1" NRC:10:075, August 4, 2010.
- Ref. 4: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "Closure Plan for U.S. EPR Instrumentation and Control Communications Independence Issues, Revision 2" NRC:10:084, September 14, 2010.
- Ref. 5: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "Closure Plan for U.S. EPR Instrumentation and Control Communications Independence Issues, Revision 3" NRC:10:089, October 10, 2010.

AREVA NP Inc. (AREVA NP) met with NRC staff members on June 25, 2010, to discuss communications independence in U.S. EPR instrumentation and control (I&C) systems. During the meeting, the NRC staff described remaining concerns regarding communications independence in the U.S. EPR I&C design as described in Chapter 7 of the U.S. EPR Final Safety Analysis Report (FSAR) and associated reports incorporated by reference in the FSAR. As understood by AREVA NP based on information provided by NRC staff on June 25, the remaining areas of concern are:

1. Complexity of design
2. Data communication between safety divisions
 - a. Between Safety Information and Control System (SICS) divisions
 - b. Between Safety Automation System (SAS) divisions

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FORM 22709VA-1 (4/12/00)

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- c. Between Protection System (PS) divisions
3. Continuous connection between non-safety Service Unit (SU) and safety divisions
4. Data communication from non-safety Process Information and Control System (PICS) to safety divisions

Subsequently, AREVA NP committed in Reference 1 to provide formal closure plans for items 1, 2a, and 4 by July 28, 2010. In Reference 2, AREVA NP provided Revision 0 of an integrated closure plan, which addressed items 1, 2a, and 4. In Reference 3, AREVA NP provided Revision 1 of an integrated closure plan, which expanded the scope of the plan to address item 3. In Reference 4, AREVA NP provided Revision 2 of an integrated closure plan, which expanded the scope of the plan to address items 2b and 2c, and committed to provide the specific option selected for resolution of item 2c in a revised version of the closure plan. In Reference 5, AREVA NP notified NRC that it no longer intended to pursue continuous, bi-directional connection of the SU (item 3) and committed to provide resolution strategy for the SU in the next revision of the closure plan.

The enclosed version of the integrated closure plan incorporates resolution strategies for items 2c and item 3 as committed in References 4 and 5, and discussed with the NRC staff during a meeting on November 9. The enclosed version of the integrated closure plan includes:

- Identification of design changes to address items 1, 2a, 2c, 3 and 4.
- Identification of interactions needed with NRC to identify specific documents to be submitted to address item 2b (as agreed on August 31).
- Identification of licensing documentation impacted by the design changes (items 1, 2a, 2c, 3 and 4).
- Timeline for conduct of engineering activities and preparation and submittal of updated licensing documentation.

The integrated closure plan is now effectively complete, in that it addresses each of the six remaining concerns regarding communications independence enumerated by the NRC staff on June 25. Based on discussions with NRC staff during public meetings on June 25, July 21, August 30 and 31, and November 9, and periodic phone calls with NRC staff, it is AREVA NP's understanding that the resolution strategies for the six items as described in the closure plan will address the NRC staff's concerns and provide a viable path to closure of these issues, pending NRC review and approval of the supporting documentation.

AREVA NP does not plan to provide future updates to the integrated closure plan. Additional details, as necessary, regarding schedule and documentation will be provided to the NRC Design Certification Project Manager as available.

As noted in Reference 1, AREVA NP will keep the NRC staff informed throughout the preparation and submittal of the revised documentation, including providing draft information for discussion prior to submittal of final information. To support that objective, the timeline identifies opportunities for interactions with the NRC staff at appropriate times based on AREVA NP completion of scheduled work activities and availability of associated documentation.

AREVA NP notes that in addition to the items specifically related to communications independence, other topics still under review by NRC in the area of U.S. EPR I&C may impact the timeline for resolution of communications independence issues. Examples of such topics include the design of the priority and actuator control system (PACS) and the associated 100 percent testing methodology, and the diversity and defense-in-depth (D3) approach. Further, the interrelationships between the various I&C topics still under review highlight the need for a coordinated approach to closure for all questions regarding Chapter 7 of the U.S. EPR FSAR.

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

Sincerely,



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

Enclosures

cc: G. Tesfaye
Docket 52-020

Closure Plan for U.S. EPR Instrumentation and Control Communications Independence Issues (Revision 4)

Introduction

AREVA NP Inc. (AREVA NP) met with NRC staff members on June 25, 2010, to discuss communications independence in U.S. EPR instrumentation and control (I&C) systems. During the meeting, the NRC staff described remaining concerns regarding communications independence in the U.S. EPR I&C design as described in Chapter 7 of the U.S. EPR Final Safety Analysis Report (FSAR) and associated reports incorporated by reference in the FSAR. As expressed by NRC staff, the areas of concern were:

1. Complexity of design
2. Data communication between safety divisions
 - a. Between Safety Information and Control System (SICS) divisions
 - b. Between Safety Automation System (SAS) divisions
 - c. Between Protection System (PS) divisions
3. Data communication from non-safety Service Unit (SU) to safety divisions
4. Data communication from non-safety Process Information and Control System (PICS) to safety divisions

AREVA NP and the staff also conducted public meetings on July 21, August 30 & 31 and November 9 to further discuss resolution of the above areas of concern.

This closure plan addresses each of the six separate issues identified above. Revision 4 of the closure plan includes the following new or updated information:

- Proposed design changes to address items 2c and 3, as discussed during the November 9 public meeting.
- Updates to proposed design changes to address item 1, reflecting progress of those design changes through AREVA NP engineering design processes.

The formal closure plan is provided in the following sections and includes:

- Identification of design changes to address items 1, 2a, 2c, 3 and 4.
- Identification of interactions needed with NRC to identify specific documents to be submitted to address item 2b (as agreed on August 31).
- Identification of licensing documentation impacted by the design changes (items 1, 2a, 2c, 3 and 4).
- Timeline for conduct of engineering activities and preparation and submittal of updated licensing documentation.

Complexity of Design (Item 1)

The following design changes will be made to reduce complexity of the I&C architecture by simplifying system architectures, minimizing global dependence on the plant data network and establishing clear separation between the risk reduction line of defense and the other lines of defense.

- The diverse actuation system (DAS) will be separated from the plant data network.
- A new human machine interface (HMI) system will be created called the diverse actuation information and control system (DAICS). This system will provide controls, indications and alarms related to the DAS such that control and monitoring necessary to mitigate a software common cause failure of the PS does not depend on the PICS or the plant data network.
- A new HMI system will be created called the severe accident information and control system (SAICS). The SAICS will provide controls, indications and alarms necessary to mitigate a severe accident. The SAICS will not be connected to the plant data network.
- All non-safety related qualified display systems (QDS) will be eliminated from the SICS.

SICS Interdivisional Communication (Item 2a)

The following design change will be made to address concerns related to data communication between divisions of the SICS:

- Communication between the safety-related panel interfaces within SICS will be eliminated.

SAS Interdivisional Communication (Item 2b)

In the August 31 public meeting, AREVA NP identified three types of SAS functions that utilize data communication between divisions:

- Automatic control functions where sensor measurements are sent between divisions, and the 2nd max or 2nd min measurement is selected for use in each division.
- Automatic actuation functions where binary signals are sent between divisions for voting logic or to maintain mechanical train and electrical division alignment.
- Human System Interface (HSI) functions where binary signals are sent between divisions for manual control purposes or sensor measurements are sent between divisions for consolidation on one video display for monitoring purposes.

Consistent with the discussion on August 31, relative to the first function type, AREVA NP is performing an analysis to quantify the reliability benefit to demonstrate an enhancement to safety provided by the current design as opposed to potential alternate designs. Results of the analysis will be available for NRC inspection in early December.

Based on discussion during the August 31 meeting, it is AREVA NP's understanding that while there is a general recognition by the NRC staff of the rationale and need for data communications relative to the second and third function types, additional information is needed regarding these function types and how they are implemented in the SAS. Therefore, AREVA NP proposes an audit in early December for the NRC to inspect a representative set of functional requirements and typical functional logic implementations of these function types. As discussed on August 31, the objective of the audit is to explain more clearly these function types and to identify the information to be submitted to support NRC approval of these function types.

PS Interdivisional Communication, SPND Functions (Item 2c)

The following design change will be made to address concerns related to data communication between PS divisions for SPND-based functions:

- Each of the 72 SPND measurements will be hardwired to each division of the PS prior to processing by PS computers. In this way, each division of the PS can perform its calculations based on all 72 SPND measurements without transmitting SPND measurements between PS divisions via networked data communications.
- In addition, AREVA NP will submit an alternative request pursuant to 10CFR50.55a(a)(3)(i) to use the same 72 SPND measurements in the four PS divisions in lieu of the independence requirements for redundant divisions in IEEE 603-1998 Clause 5.6.1. This alternative request will demonstrate that the proposed alternative provides an acceptable level of quality and safety.

Service Unit (Item 3)

The following design change will be made to address concerns related to data communication between the non-safety related SU and the safety divisions:

- The SU will normally be disconnected from the safety divisions by a physical disconnect. Administrative controls (technical specifications) will govern operability of safety function processors when the SU is physically connected to the safety divisions. When physically connected, the SU communication with the safety function processors will operate as currently designed in a bi-directional capacity.

Data Communication from PICS to Safety Divisions (Item 4)

The following design change will be made to address concerns related to bi-directional data communication between the non-safety related PICS and safety divisions by modifying those communication paths.

- Only communication from the PS and SAS to PICS will be allowed. The communication paths will be restricted so that PICS cannot send information to the PS and SAS.

Impacted Licensing Documents

The licensing documents expected to be impacted by closure activities related to items 1, 2a, 2c, 3 and 4 are identified in Table A-1. Additional impacts may be identified as details of the design changes are developed and finalized. As details of the resolution of item 2b are defined, the associated impacted licensing documents will be identified.

Impacted RAI responses will be identified and communicated to the NRC staff separately, since details of the design changes are needed to comprehensively identify impacted responses due to the additional level of detail contained in typical RAI responses.

Table A-1. Impacted Licensing Documents

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| Impacted U.S. EPR FSAR Tier 2 Material |
| Tables 3.10-1, 3.11-1 Sections 7.1.1.3, 7.1.1.4, 7.1.1.6, 7.1.2.3, and 7.1.2.6 Tables 7.1-1, 7.1-2 Figures 7.1-1, 7.1-2, 7.1-3, 7.1-4, 7.1-6, 7.1-7, 7.1-8, 7.1-9, 7.1-13, 7.1-17, 7.1-20, 7.1-21 Sections 7.2.1.1, 7.2.1.3, 7.2.2.2 and 7.2.2.3 Table 7.2-2 Figures 7.2-2, 7.2-7 Sections 7.3.1.1 Figure 7.3-12 Section 7.4.1.1 Section 7.5.2.2.4 Section 7.6.1.1 Sections 7.8.1.1.3, 7.8.1.2.3, 7.8.1.2.4, and 7.8.2.1 |
| Chapter 16, Tech Spec Bases 3.3.1 and Tech Spec 3.3.1 |
| Impacted U.S. EPR FSAR Tier 1 Material |
| Sections 2.4.1., 2.4.2, 2.4.3, 2.4.4, and 2.4.24 |
| Impacted Sections of ANP-10304 Rev. 1, "U.S. EPR Diversity and Defense-in-Depth Assessment" |
| Sections 2, 3, 4, and A.2.2 |
| Impacted Sections of ANP-10309P Rev. 0, "U.S. EPR Digital Protection System Technical Report" |
| Sections 2, 3, 5, 6, 7, and 12 |

Timeline

The timeline shown in Figure A-1 reflects the activities related to closure of the I&C issues that are subject of this closure 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.

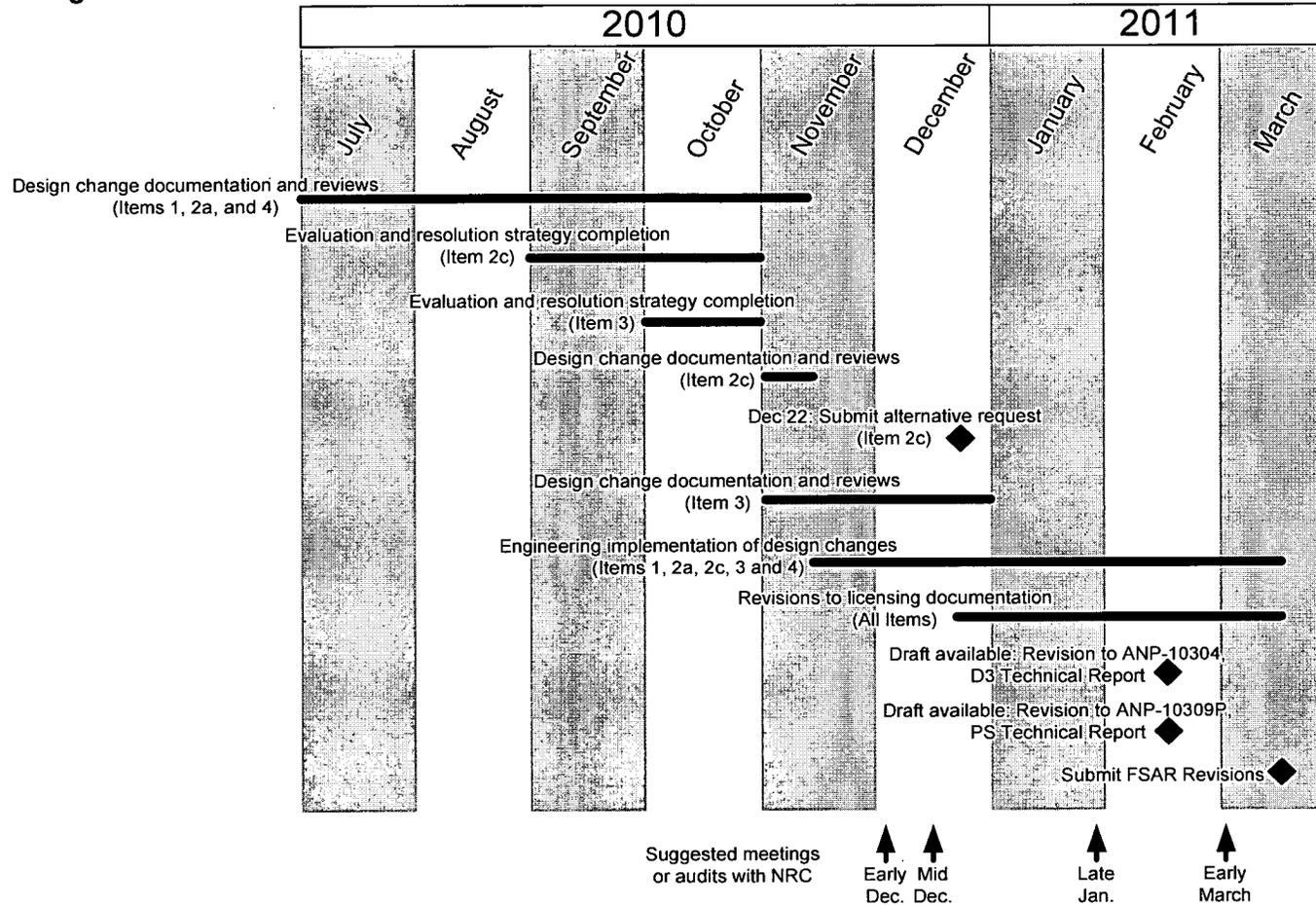
The schedule activity designated "design change documentation and review" reflects implementation of a robust design change control process and includes activities such as:

- Evaluating design options in cases where the design change can be implemented in more than one way.
- Defining and documenting the details of the design changes.
- Multi-disciplinary reviews of the proposed changes including assessment of design and licensing impacts
- Formal design review boards and approvals.

The schedule activity designated "engineering implementation of design changes" involves revising engineering documentation to reflect the approved design changes.

The schedule activity designated "revisions to licensing documentation" involves updating the FSAR and technical reports to reflect design changes and to incorporate additional information to resolve each item.

Figure A-1. Timeline for U.S. EPR Instrumentation and Control Communications Issues Closure Plan



- Early Dec. - Audit to inspect design documentation for SAS automatic actuation functions.
 - Audit to inspect reliability/enhancement information for SAS automatic control functions.
 - Audit to inspect design documentation for SAS HSI functions.
- Mid Dec. - Audit to discuss finalized design changes (items 1, 2a, 2c and 4), prior to revising licensing documentation.
 - Audit to discuss progress of design change (item 3).
- Late Jan. - Audit or public meeting to discuss progress of licensing document updates (items 1, 2a, 3, and 4), and review drafts of any completed revisions.
- Early March. - Audit to discuss and review drafts of updated licensing documentation prior to mid-March submittal.