ArevaEPRDCPEm Resource

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Sent: Tuesday, September 13, 2011 8:14 AM
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Cc: Mott, Kenneth; Zhang, Deanna; Morton, Wendell; Spaulding, Deirdre; Truong, Tung; Zhao, Jack; Mills, Daniel; Jackson, Terry; Canova, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: Draft - U.S. EPR Design Certification Application RAI No. 512 (6048), FSAR Ch. 7
Attachments: Draft RAI_512_ICE1_6048.doc

Attached please find draft RAI No. 512 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,
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Hearing Identifier: AREVA_EPR_DC_RAIs
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Request for Additional Information No. 512(6048), Revision 0

9/13/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 07.08 - Diverse Instrumentation and Control Systems
Application Section: ANP-10304 Revision 4

QUESTIONS for Instrumentation, Controls and Electrical Engineering 1 (AP1000/EPR Projects) (ICE1)

07.08-50

OPEN ITEM

Follow-up to RAI 303, Question 07.03-28

Clarify the role of the safety automation system (SAS) regarding defense-in-depth and diversity (D3) and the plant response if it were to fail due to a postulated common-cause failure (CCF). Identify automatic or manual actions that would compensate for such failure.

10 CFR Part 50, Appendix A, General Design Criteria 22, states, in part, that design techniques, such as functional diversity or diversity in component design and principles of operation, shall be used to the extent practical to prevent loss of the protection function. One of the purposes of the diversity analysis method described in NUREG/CR-6303 is to postulate common-cause failures and to determine what portions of a design are uncompensated with regards to D3. NUREG/CR-6303 also states that manual operator action is permissible as a diverse means of response to postulated CCF if, among other things, sufficient information and time is available for the operator to detect, analyze, make decisions, take action, and correct reasonably probable errors of operator function.

In Table A.2-1 of Technical Report ANP-10304, "U.S. EPR Diversity and Defense-in-Depth Assessment Technical Report," Revision 4 (ML11188A198), the applicant classifies “Decrease in feedwater temperature, "Increase in feedwater flow,” “Increase in steam flow,” “Inadvertent opening of SG relief or safety valve,” and “Loss of normal feedwater flow” events as anticipated operational occurrences (AOOs). In the event of a postulated software CCF of the protection system, if necessary, the diverse actuation system (DAS) would actuate the emergency feedwater (EFW) system upon the low steam generator (SG) level actuation setpoint being reached. Once EFW is initiated by DAS, the operator is credited for controlling the EFW system manually to maintain SG level and to remove decay heat. Technical Report ANP-10304 states that, after DAS initiation of EFW on low SG level, the operator action credited is:

- For loss of normal feedwater flow event, manual operation of the EFW flows is required for the operators to prevent SG overfill, during long-term control. It takes approximately one hour to fill the SG with EFW from the low level EFW actuation setpoint to the protection system EFW isolation setpoint. Therefore, there is sufficient time for the operator to manually control SG level with the EFW system.

- For decrease in feedwater temperature event, main feedwater may be isolated on high SG level (a DAS function). If main feedwater is isolated, EFW actuates once SG level decreases to the low level DAS setpoint. The operator then controls SG level to remove decay heat using the EFW system. It takes more than 60 minutes for the level to recover from the EFW actuation setpoint, giving the operator sufficient time to manually control SG level.
- For increase in feedwater flow event, the operator controls the EFW system manually to maintain SG level and remove decay heat. It takes approximately 60 minutes for the SG level to recover to its nominal value from the EFW actuation setpoint. This provides the operator adequate time to manually control SG level.
- For inadvertent opening of an MRST or MSSV event, after 30 minutes, the operator terminates EFW flow to the affected SG.

In Technical Report ANP-10304, the staff found that SAS is only credited to *limit EFW flow* to a depressurized SG. It appears the stated times for SG fill up after EFW actuation by the DAS include the EFW flow limitation by SAS. Furthermore, if operator action is used for limiting EFW flow in other events, why is the SAS credited to limit flow for a depressurized SG? For example, is the limit flow function of SAS to prevent SG overfill, to prevent pump runout, or to prevent a rapid cooldown of the RCS and therefore mitigate a pressurized thermal shock event or reactor restart? From the staff's observation, SAS is the only system that can provide this limit flow function. Given a common-cause failure of SAS, an AOO or postulated accident, and other systems functioning properly, what type of automatic or manual actions would address the loss of EFW limit flow function provided by SAS? If operator actions are used, discuss the basis for why use of operator actions is acceptable.