ArevaEPRDCPEm Resource

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Sent:	Tuesday, June 08, 2010 11:27 AM
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Subject:	Draft - U.S. EPR Design Certification Application RAI No. 416(4767,4749), FSAR Ch. 6
Attachments:	Draft RAI_416_SPCV_4767_SRSB_4749.doc

Attached please find draft RAI No. 416 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. 416(4767, 4749), Revision 1

6/8/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 06.02.01 - Containment Functional Design
SRP Section: 06.03 - Emergency Core Cooling System

Application Section: FSAR Chapter 6

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)
QUESTIONS for Reactor System, Nuclear Performance and Code Review (SRSB)

06.02.01-94

Follow-up to RAI 368, Question 06.02.01-75:

a. The CONVECT system is a new design. The rupture foils and convection foils are safety-related components of the system. The safety evaluation of U.S. EPR design with respect to the compliance with GDC 16 and GDC 38 depends on the availability of performance information of the rupture and convection foils. Experimental evidence is needed to demonstrate that (1) the foils will perform their intended function as is described in the U.S. EPR FSAR, and (2) the design parameters of the foils are properly modeled in the containment safety analysis.

The intended functions of the foils are:

1. The foils will rupture when a pre-determined pressure differential is applied on them,

2. The foils will rupture in either direction,

3. The foils will rupture within a relatively narrow band around the pre-determined pressure differential, thus rupture of some of the foils will not prevent rupture of the rest of the foils,

4. When the foils rupture, they will not create debris that could interfere with the operation of the heat removal systems,

5. The rupture foils will have sufficient flow area to fulfill the system's function,

6. The convection foils will drop down by gravity with some delay, when a pre-determined temperature is reached,

7. The convection foils will drop down even against a specified pressure differential.

The following design parameters enter into the containment safety evaluation:

1. Rupture pressure differential of foils in both the upward and downward direction
2. Uncertainty band of the rupture pressure differential
3. Open flow area of the foils after rupture
4. Activation temperature of the convection foils
5. Delay time associated with the convection foils opening
6. Uncertainty associated with operation of the convection foils
7. Pressure differential against which the convection foils are designed to function.

Provide a justification that the CONVECT system will function as described in the safety analysis under the full range of conditions relied upon in the safety analysis.

b. FSAR Rev. 2 interim Section 6.2.1 describes the design feature and evaluation for the CONVECT system. The performance information for CONVECT system is scattered in all of subsections. At most, Table 6.2.1-25 provides some information on the cause and timing for foil opening. Provide a comprehensive summary of CONVECT system (foils and dampers) performance information (type of foil or damper, location, opening mechanism, timing, opening area) as assumed or credited in the safety analyses of all LOCAs (LBLOCA, SBLOCA, MSLB and any other accident/transient that will lead to breaks in the containment) as, for example, those listed in Tables 6.2.1-1 and 6.2.1-25. This summary combined with the experimental evidence provided in response to the previous question will facilitate the review of CONVECT system design.

06.02.01-95

Follow-up to RAI 266, Question 06.02.01-47

In letter dated 12/10/2009 in response to RAI No. 266 Supplement 2, the applicant provided Gothic input decks. In a review of the GOTHIC input tables (Thermal Conductors) generated at the NRC from file "clps_np_s_sd2, Oct/27/2009", it was noted that containment liner wall areas between cells v21 and v22 showed significant skewing (12280 vs. 15067.8 ft^2). Please verify that this skewed set of liner areas are currently being used in AVEVA Chapter 6 calculations. Discuss the reason for the skewing and whether these area values are correct. If not correct, provide a corrected set of v21/v22 liner areas and discuss the impact this error may have on containment pressure, local (v21 and v22) gas and liner temperatures.

06.03-15

Follow-up to RAI 212, Question 6.03-6

RG 1.1 establishes the regulatory position that emergency core cooling and containment heat removal systems should be designed so that adequate NPSH is provided to system pumps assuming maximum expected temperatures of pumped fluids and no increase in containment pressure from that present prior to postulated LOCAs.

RG 1.82 Revision 3 states:

> ECC and containment heat removal systems should be designed so that sufficient available NPSH is provided to the system pumps, assuming the maximum expected temperature of pumped fluid and no increase in containment pressure from that present prior to the postulated LOCA.
>
> For sump pools with temperatures less than 212F, it is conservative to assume that the containment pressure equals the vapor pressure of the sump water. This ensures that credit is not taken for the containment pressurization during the transient.

NRC Standard Review Plan (SRP) 6.2.2, "Containment Heat Removal Systems" (NUREG-0800, Revision 5, dated March 2007) states that RG 1.82, Revision 3 describes methods acceptable to the staff for evaluating NPSH. SRP 6.3, "Emergency Core Cooling System" states that the design of the ECCS should conform to the recommendations of Regulatory Guide 1.1.

US EPR DCD Table 1.9-2 shows that US EPR conforms to RG 1.1 and RG 1.82.

AREVA responded to a RAI 212, Question 6.03-6 – related to NPSH) and stated the following:

> AREVA NP elected to use the saturation pressure corresponding to the peak calculated IRWST temperature, instead of the containment pressure prior to the postulated accident as recommended by RG 1.82. This is justified since the containment pressure prior to the postulated accident (atmospheric) is not realistic for the peak calculated IRWST temperature of 230F. The realistic pressure above the IRWST is the saturation pressure corresponding to the peak IRWST temperature.

To conform to the referenced guidance it is necessary that the proper performance of emergency core cooling and containment heat removal systems be independent of calculated increases in containment pressure caused by postulated loss of coolant accidents.
The alternative approach described by AREVA (use of saturation pressure in NPSH analysis) is inconsistent with the US EPR DCD commitment to follow RG 1.1 and RG 1.82, Revision 3, and SRP 6.2.2 criteria (e.g., use of atmospheric pressure in NPSH analysis). AREVAs alternative approach did not address the basic premise behind the regulatory criteria and did not evaluate how their alternative to the SRP (RG) criteria provides an acceptable method of complying with NRC regulations. Additional information is needed to complete a safety finding that is clearly tied to 10CFR 50.46(b)(5). Therefore, NRC staff request that AREVA justify why the selected approach, use of containment accident pressure (CAP) to support ECCS NPSH analysis, is acceptable.