ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Thursday, July 21, 2011 10:20 AM
To: 'usepr@areva.com'
Cc: Peng, Shie-Jeng; McKirgan, John; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: Draft - U.S. EPR Design Certification Application RAI No. 500 (5944), FSAR Ch. 6
Attachments: Draft RAI_500_SPCV_5944.doc

Attached please find draft RAI No. 500 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,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
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Created By: Getachew.Tesfaye@nrc.gov

Recipients:
"Peng, Shie-Jeng" <Shie-Jeng.Peng@nrc.gov>
Tracking Status: None
"McKirgan, John" <John.McKirgan@nrc.gov>
Tracking Status: None
"Carneal, Jason" <Jason.Carneal@nrc.gov>
Tracking Status: None
"Colaccino, Joseph" <Joseph.Colaccino@nrc.gov>
Tracking Status: None
"ArevaEPRDCPEm Resource" <ArevaEPRDCPEm.Resource@nrc.gov>
Tracking Status: None
"'usepr@areva.com'" <usepr@areva.com>
Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

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Request for Additional Information No. 500(5944), Revision 0

7/21/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 06.02.01.02 - Subcompartment Analysis
Application Section: 6.2.1.2

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

06.02.01.02-11

The following question is a follow-up to the subcompartment analysis calculation audit held in Twinbrook, MD between May 25 and July 7, 2011 regarding Calculation 32-9067227-003, “Bounding High Energy Lines in Reactor Building." In Sec. 2.2.5, it states that the pressure and temperature of RCS, main feedwater, CVCS used for calculating the mass and energy release are the operating pressure and temperature at 100% power. The Standard Review Plan (SRP) 6.2.1.4 specifies 102% power. Since the power considered for analysis (100% power) is different from the SRP acceptance criterion (102% power), justify this alternative to the SRP acceptance criterion to assure its compliance with the NRC regulations. In the same section, it describes that the operating pressure and temperature used for the calculation of mass and energy release from Main Steam and emergency feedwater are based on hot zero power condition. Similarly, justify this alternative (hot zero power) to the SRP acceptance criterion (102% power) to assure its compliance with the NRC regulations.

06.02.01.02-12

The following question is a follow-up to the subcompartment analysis calculation audit held in Twinbrook, MD between May 25 and July 7, 2011 regarding Calculation 32-9067227-003, “Bounding High Energy Lines in Reactor Building." In Sec. 2.3.1, it states that the critical flow is calculated based on the GOTHIC technical manual Appendix A. The pressure considered in Appendix A is in the range of 1 and 3000 psia. However, the stagnantion pressure listed in the high energy lines can be higher than 3000 psia. Explain how the critical flow is calculated for the case with pressure higher than 3000 psia. The SRP 6.2.1.4 specifies that the critical flow should be calculated conservatively. Justify the calculation method applied for the case being beyond range to be conservative and complied with the NRC regulations.

06.02.01.02-13

The following question is a follow-up to the subcompartment analysis calculation audit held in Twinbrook, MD between May 25 and July 7, 2011. As described in Calc 32-7004322-000, “Subcompartment Pressurization of Steam Generator Rooms,” the mass and energy release from line LAB90BR005 break in room UJA23008 termed as Modified

Feedwater Line Break Mass and Energy, is based on the CRAFT2 computer model calculation. In that calculation, it models the pressure loss in pump and long pipe on the steam generator side of the break realistically. Provide the total loss coefficient from steam generator through pump and long pipe to the break. SRP Section 6.2.1.4 specifies that the critical flow should be calculated conservatively. Since the total loss will affect the critical flow significantly, it should be determined and provided as a basis for the demonstration of any further application (see below) of the calculated mass release to be conservative.

The same Modified Feedwater Line Break Mass and Energy has been applied to a few pressurization calculations for compartments, e.g. UJA23013, UJA23014, UJA23015 and UJA23016 (Calc 32-7003808-002) as based on the consideration of boundedness of the operating condition. However, it is not clear if the total loss coefficient used in the CRAFT2 calculation as provided in the above question will bound the total loss coefficient for each compartment case as identified. Provide the total loss coefficient for each above mentioned compartment's pressurization and demonstrate the appropriateness for the application of Modified Feedwater Line Break Mass and Energy to these compartments in terms of the total loss coefficient.

06.02.01.02-14

The following question is a follow-up to the subcompartment analysis calculation audit held in Twinbrook, MD between May 25 and July 7, 2011. In Appendix G of Calc 32-7003667-002, "Subcompartment Analysis at +5 ft Elevation for CVCS and FPPS Rooms," the mass and energy release from lines KBA10BR002, KBA10BR004, and KBA34BR012, are calculated by a detailed modeling of CVCS piping and heat exchanger with RELAP. Provide the total loss coefficient from water source through elbows and pipe or heat exchanger to the break. The SRP 6.2.1.4 specifies that the critical flow should be calculated conservatively. Since the total loss will affect the critical flow significantly, it should be determined and provided as a basis for the demonstration of any further application (see below) of the calculated mass release to be conservative.

The calculated line beak mass and energy for these lines have been applied to a few pressurization calculations for compartments, e.g. UJA11002, UJA11022, UJA11023, UJA11024 and UJA07029 (Calc 32-7003200-002 and 32-7003667-002). However, it is not clear if the total loss coefficients used in these RELAP calculations have bounded the total loss coefficient for each compartment case as identified. Specifically, the compartment UJA11022 does not actually contain the line KBA34BR012 but the RELAP-calculated line break mass and energy for KBA34BR012 is applied to the pressurization calculation of compartment UJA11022. Similarly, the compartment UJA11024 does not actually contain the line KBA10BR002 but the RELAP-calculated line break mass and energy for KBA10BR002 is applied to the pressurization calculation of compartment UJA11024. The pressurization calculation of compartment UJA11023 applies the RELAP-calculated line break mass and energy for KBA10BR002 and KBA10BR004 without knowing if the total loss coefficient to the UJA11023's break is bounded by those of KBA10BR002 and KBA10BR004 as modeled with RELAP. Provide the total loss coefficient for each above mentioned compartment's pressurization and demonstrate the

appropriateness for the application of RELAP-calculated line break mass and energy in terms of the total loss coefficient.

06.02.01.02-15

The following question is a follow-up to the subcompartment analysis calculation audit held in Twinbrook, MD between May 25 and July 7, 2011. Provide the information for choked flow model including discharge coefficient that is used in CRAFT2 and RELAP for the break mass release rate calculations. Justify the model used is as conservative as what SRP 6.2.1.4 specifies.

06.02.01.02-16

The following question is a follow-up to the subcompartment analysis calculation audit held in Twinbrook, MD between May 25 and July 7, 2011. The portion of “Valve Data” in GOTHIC run output shows that all valves (or doors) are valve type 4 while the input data file shows that it should have 17 valve types. There exists inconsistency. In addition, the “Valve Performance Curve” portion seems having the data under wrong titles of “Travel” and “Loss Coefficient”. These two titles should be switched. Evaluate if the required or intended input data were used correctively and ensure the calculated results still comply with the NRC regulations.

06.02.01.02-17

The following question is a follow-up to the subcompartment analysis calculation audit held in Twinbrook, MD between May 25 and July 7, 2011. The opening time for the following doors as shown in Table 6.2.1-13 of Rev. 3-Interium FSAR markup (See Response to RAI No. 457 Supplement 4 on 12/21/2010) is not the same as the data specified in GOTHIC input, “Summary of Subcompartment Analysis in the Reactor Building”):

FSAR Markup GOTHIC Input

Opening Time (sec) Opening Time (sec)

+5 ft Door 4 0.75 0.50

+5 ft Door 14 0.75 0.50

+45 ft Door 2 0.75 0.50

Since the opening times as described in FSAR are not conservative as compared with those applied in the GOTHIC calculation, justify these differences to assure that the NRC regulations are complied.

In addition, the door full opening area should also be provided in the same FSAR table to reflect a complete set of door characteristics data. Otherwise, an annotation should be provided in this table to link the availability of full opening area with some other FSAR sections. A complete and consistent set of data should be maintained to assure the integrity of safety grade doors and to further assure the compliance of NRC regulations.