ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Friday, June 12, 2009 10:55 AM
To: 'usepr@areva.com'
Cc: Fuller, Edward; Clark, Theresa; Phan, Hanh; Hamzehee, Hossein; Mrowca, Lynn; Chowdhury, Prosanta; Rycyna, John; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 236 (2589), FSAR Ch. 19
Attachments: RAI_236_SPLB_2589.doc

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on May 21, 2009, and discussed with your staff on June 11, 2009. Draft RAI Question 19-308 was deleted and Draft RAI Question 19-313 was modified as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
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Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 564

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Request for Additional Information No. 236 (2589), Revision 0

6/12/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: 19

QUESTIONS for PRA Licensing, Operations Support and Maintenance Branch 2 (ESBWR/ABWR Projects) (SPLB)

19-308

[Intentionally deleted.]

19-309

(Follow-up to RAI 19-160)

In response to RAI 19-160, the results of EPR-specific RELAP5 analyses are presented for a main steam line break inside containment for about 3 hours after accident initiation. These results show that after 2.8 hours, the containment pressure is within ~45 psi of the median failure pressure of the containment.

Please provide the results of the analyses that extend to 24 hours and supply all the "best estimate" reactivity coefficients used in these analyses (i.e., Boron, Scram, Doppler and Moderator as a function of the relevant independent variable).

19-310

(Follow-up to RAI 19-47)

Please provide the following information for the concrete below the spreading floor that was used in the MAAP MCCI analyses:

(a) Concrete compositions (mass fraction of each constituent), including any rebar;
(b) Concrete density;
(c) Concrete ablation temperature;
(d) Concrete solidus temperature; and
(e) Concrete liquidus temperature.

19-311

(Follow-up to RAI 19-236)

The response to RAI 19-236 discusses the effect of using the mean core damage frequency (CDF) as opposed to point estimate CDF value. The applicant indicated that the point estimate value was used because, "the mean CDF is not unequivocally

defined." The applicant added that, "the mean CDF value could vary significantly from one Monte Carlo run to another." If the statement is true, and the applicant has experienced such a significant change in the mean CDF value, the validity of various quantiles (e.g., mean, median, 5^{th}, etc.) listed in the COL FSAR may be uncertain. The fidelity of the simulation should be such that the mean value would remain relatively unchanged from one Monte Carlo simulation to the next. Please confirm that the reported mean values as well as the uncertainty distributions are numerically reasonable representation of the uncertainty bands and are not significantly impacted by the Monte Carlo sampling process.

19-312

(Follow-up to RAI 19-231)

Based on the report containing review of the available test data and results that was made available for NRC audit at the AREVA NP's Twinbrook office, please provide the following additional information for NRC review:

1. The material characteristics of the stabilized ZrO_2 with regard to radiation effect, materials interactions, phase transition, and the thermal/ mechanical shock for the Zirconia bricks planned for the U.S. EPR.

2. The expected loading conditions in the reactor pit/transfer channel relative to the ZrO_2 characteristics to show that thermal and mechanical stability can be maintained under all conceivable severe accidents.

3. The bonding maximum local temperature and thermal gradient with a melt of high temperature inside the reactor pit and the transfer channel under severe accident loading conditions (i.e., melt superheat, compositions, configurations, etc.)

4. A summary of the industrial knowledge base referenced in the report that is applicable to the Zirconia under consideration for U.S. EPR.

5. A summary of experimental date referenced in the report on interaction of metallic melts with ZrO_2 including the impact temperature, metallic melt composition with and without oxidic slag for U.S. EPR–specific Zirconia bricks.

6. Results of experimental data versus theoretical predictions referenced in the report for various severe accident loading conditions, as related to the behavior of ZrO_2 under U.S. EPR-specific conditions with regards to thermo-chemical stability, expected response under high radiation and high temperature conditions (e.g., thermal, mechanical, thermal shock).

19-313

A New section on risk metrics (Section 4.1) is included in the "AREVA NP Environmental Report Standard Design Certification," ANP-10290, draft Revision 1, wherein the core damage frequency (CDF) is used as the primary risk metric to characterize the frequency of occurrence of a severe accident. The actual radiological risk, as calculated in the U.S. EPR Level 3 PRA, is used to quantify averted costs for offsite

consequences. Also, as indicated through various RAI responses, AREVA has corrected the radionuclide core inventory to higher values. The offsite consequence results used in the SAMDA analysis indicate slight reduction in total offsite population dose, which contradicts the expected higher value, even if the release fractions were to remain unchanged. Accordingly:

1. Please provide the fraction of the total CDF that is captured among the release categories considered in the Level 3 PRA, as well as the values of the release category frequencies.
2. Please provide the corrected radionuclide core inventory and released fractions used in the level 3 PRA analysis.
3. For the SAMDA candidate development, the top 100 Level 1 cutsets were chosen, equating to approximately 50% of the total CDF. This may not be conservative, however, because this cutset list may not correspond to the top 100 cutsets contributing to the large release frequency (LRF). Please provide the list of the top 100 LRF cutsets, and indicate the fraction of the LRF these comprise. In addition, please list and describe any additional candidates identified from using the top 100 LRF cutsets instead of the top 100 CDF cutsets, and which of these additional candidates are categorized as "consider for further evaluation." If any do fall into that category, please explain how the Maximum Benefit Evaluation would be affected.
4. In response to RAI 19-238, the applicant indicated that the screening process for the “Vent MSSV’s in containment” will be changed from “Not Applicable” to "Excessive Implementation Cost,” in the revised report. But, this change was not included in this revision. This change would also affect the “Result and Summary” section. Please make this change in the next revision of the report.