

ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Tuesday, January 24, 2012 4:38 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); NOXON David (AREVA); Ford, Tanya; Miernicki, Michael
Subject: Response to U.S. EPR Design Certification Application RAI No. 532 (6155), FSAR Ch. 19
Attachments: RAI 532 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 532 Response US EPR DC," provides a schedule since a technically correct and complete response to the four questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 532 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 532 — 19-352	2	2
RAI 532 — 19-353	3	4
RAI 532 — 19-354	5	5
RAI 532 — 19-355	6	6

A preliminary schedule for a technically correct and complete response to the four questions is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by February 21, 2012.

Question #	Response Date
RAI 532 — 19-352	February 21, 2012
RAI 532 — 19-353	February 21, 2012
RAI 532 — 19-354	February 21, 2012
RAI 532 — 19-355	February 21, 2012

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.

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From: Tesfaye, Getachew [<mailto:Getachew.Tesfaye@nrc.gov>]
Sent: Friday, December 16, 2011 10:03 AM
To: ZZ-DL-A-USEPR-DL

Cc: Grady, Anne-Marie; Mrowca, Lynn; Ford, Tanya; Segala, John; ArevaEPRDCPEm Resource

Subject: U.S. EPR Design Certification Application RAI No. 532 (6155), FSAR Ch. 19

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on November 25, 2011, and discussed with your staff on December 13, 2011. Draft RAI Questions 19-352, 19-354, and 19-355 were 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, excluding the time period of **December 24, 2011 thru January 2, 2012, to account for the holiday season** as discussed with AREVA NP Inc. For any RAIs that cannot be answered **within 40 days**, it is expected that a date for receipt of this information will be provided to the staff within the 40-day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3704

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4AA01BF)

Subject: Response to U.S. EPR Design Certification Application RAI No. 532 (6155),
FSAR Ch. 19
Sent Date: 1/24/2012 4:38:04 PM
Received Date: 1/24/2012 4:38:08 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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Files	Size	Date & Time
MESSAGE	2591	1/24/2012 4:38:08 PM
RAI 532 Response US EPR DC.pdf		20890

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to
Request for Additional Information No. 532(6155), Revision 0

12/16/2011

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: 19.2

QUESTIONS for PRA Licensing, Operations Support and Maintenance Branch 1
(AP1000/EPR Projects) (SPLA)

Question 19-352:

Follow-up to RAI 457, Question 06.02.02.-81

1. Provide summaries of all changes in the MAAP input model, including
 - a. Nodalization
 - b. Geometrical input
 - c. Error correction
 - d. Implication of changes (including correction of errors)
2. Provide a summary of the phenomenological modeling differences between MAAP 4.0.7 and 4.0.6 and their impact on in-vessel accident progression with emphasis on MAAP-based specifications for analysis of various PRA and severe accident issues (e.g., ex-vessel steam explosions, hydrogen generation and distribution in containment, etc.)
3. Indicate which nodalization, coarse or fine, will be the basis for the new results provided in the FSAR.

Response to Question 19-352:

A response to this question will be provided by February 21, 2012.

Question 19-353:**OPEN ITEM****Follow-up to RAI 6, Question 19-79 and RAI 236, Question 19-335**

On October 5, 2011, AREVA presented changes in the input data and modeling issues that could affect the nature and sequence of severe accident progression. The changes were significant and affect all MAAP-based analyses that had been provided by AREVA and reviewed by NRC. Therefore, it is requested that AREVA provide results of calculations using the revised/new MAAP inputs for the following accident scenarios:

- a. Station Blackout-Induced Seal LOCA with Containment Isolated [MAAP run St1.1 -5 bar)
- b. Station Blackout-Induced Seal LOCA with Failure of Containment Isolation [MAAP run St1.5]
- c. High Pressure SBO with dry MCCI [MAAP run St1.10a]
- d. Main Steam Line Break (MSLB) inside Containment
- e. Induced-Steam Generator Tube Rupture without Fission Product Scrubbing [MAAP run St2.3]

As a minimum, please provide MAAP-calculated results for the following process variables:

- a. Reactor power (for MSLB only)
- b. RPV pressure, water level and core exit temperature
- c. Steam generator secondary side pressure and level
- d. Cumulative hydrogen generation during in-vessel phase and ex-vessel phase (Long-term)
- e. Core debris temperature inside the reactor pit and spreading area
- f. Containment pressure and temperature
- g. Local mole fractions of gases inside various containment compartments
- h. Water level in the IRWST, the reactor pit, and the core spreading room
- i. Time and location of creep-induced reactor coolant system (RCS) (i.e., hot leg, surge line, and SG tube) failure (specifically for MAAP run St1.10a; present in terms of creep damage parameters or structure temperatures)
- j. Predicted source terms at 24 and 48 hours into the accident (specifically for MAAP run St2.3)

These data are requested to be provided in digitized, electronic form (e.g., RPV pressure as a function of time, in columns of an Excel spreadsheet), as well as in plots as a function of time, where appropriate.

Response to Question 19-353:

A response to this question will be provided by February 21, 2012.

Question 19-354:

OPEN ITEM

Follow-up to RAI 349, Question 19-334 and RAI 471, Question 6.2.5-21

On October 5, 2011, AREVA presented new analyses that indicated major revisions to the previously analyzed conditions. These changes affect the quantities of hydrogen generated during the in-vessel and the ex-vessel phases of severe accidents, and the specification of conditions that are used in the analysis of severe accident issues (e.g., hydrogen distribution, ex-vessel steam explosion, reactor cavity plug failure, etc.). Therefore, it is requested that AREVA provide new MAAP results that could be used to:

- a. Demonstrate the effect of the containment nodalization on potential pocketing and maldistribution of hydrogen in the containment. Provide results for both nodalizations, coarse and fine, for the LOOP-TR scenario.
- b. Identify the conditions and timing for the various failure events as they relate to the ex-vessel steam explosions and cavity plug failure. These should include the specification (mass, temperature, composition, and timing) of relocating molten core debris into the lower plenum, reactor pit and transfer canal.
- c. Assess changes in the phenomenological events (e.g., induced rupture of the reactor coolant system pressure boundary, hydrogen production, etc.) which could potentially impact the assigned split fractions in the containment event tree. Specifically, please provide changes in top event probabilities that are affected by the new MAAP results, and identify any changes to the core damage end states.

Response to Question 19-354:

A response to this question will be provided by February 21, 2012.

Question 19-355:

Follow-up to RAI 457, Question 06.2.2-81

The new/revised MAAP-calculated results show apparent anomalies in core exit temperature and the relationship between in-vessel hydrogen generations upon accumulator injection for the LOOP-PI and the LLOCA cases. Therefore, it is requested that AREVA assess the core exit temperature anomalies and the effect of the MAAP metal oxidation and candling models (including their influence on whether accumulator injection quenches the core debris) in the MAAP analyses, and to determine the implications of different core exit temperatures on the planned SAMG implementation.

Response to Question 19-355:

A response to this question will be provided by February 21, 2012.