ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Thursday, October 15, 2009 8:19 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); WILLIFORD Dennis C (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 282, FSARCh. 9
Attachments: RAI 282 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 282 Response US EPR DC.pdf" provides a technically correct and complete response to the one question.

The following table indicates the pages in the response document, "RAI 282 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 282 — 09.01.01-25	2	3

This concludes the formal AREVA NP response to RAI 282, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Ronda Pederson
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, September 15, 2009 7:40 AM
To: ZZ-DL-A-USEPR-DL
Cc: Patel, Amrit; Lu, Shanlai; Donoghue, Joseph; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 282 (3579), FSARCh. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 25, 2009, and on September 14, 2009, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. 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
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 880

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Subject: Response to U.S. EPR Design Certification Application RAI No. 282, FSARCh. 9
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From: Pederson Ronda M (AREVA NP INC)

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MESSAGE	2084	10/15/2009 8:18:54 AM
RAI 282 Response US EPR DC.pdf	79194	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
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Response to

Request for Additional Information No. 282 (3579), Revision 0

9/15/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.01.01 - Criticality Safety of Fresh and Spent Fuel Storage and Handling
Application Section: 9

QUESTIONS for Reactor System, Nuclear Performance and Code Review (SRSB)

Question 09.01.01-25:

This RAI is being issued in response to AREVA's "Response for Additional Information No. 250, Supplement 1" regarding Question 09.01.01-21. It is understood that specifying an initial source distribution as uniform over the active fuel region has a significant impact on spatial source convergence. However, applying this initial source distribution and using 50 or 100 skipped cycles is not a basis for assuming source convergence. Sensitivity studies show that there is a trend between the numbers of skipped cycles used and the effect on the system k_{eff}.

In the response, a negative bias is presented when increasing the number of skipped cycles from 50 to 100. The response states twice that there is a "negligible effect" on the calculated k_{eff}. However, in Table 4.8.3 of Unistar Topical Report UN-08-001, "Spent Fuel Analysis," regarding the Region 2, 5.0 wt% case, the calculational bias is given as 0.0009 Δk and the temperature bias is given as 0.0020 Δk. Both of these biases are on the same order of magnitutde of the reported Δk increase due to increasing the number of skipped cycles from 50 to 100, which would imply that the effect is not negligible.

Demonstrate that source convergence has been reasonably achieved. NRC staff believes that showing the change in k_{eff} by increasing the number of skipped cycles until there is convergence in the k_{eff} change is adequate to determine the proper number of skipped cycles (e.g. perform additional calculations using 200, 400, and 800 skipped cycles and examine the change in k_{eff} relative to the initial 50 skipped cycles case).

Response to Question 09.01.01-25:

The additional calculations with 200, 400 and 800 skipped cycles were performed as suggested, and the results of all calculations are summarized in Table 09.01.01-25-1 – Sensitivity of k_{eff} Results Versus the Number of Skipped Cycles. The table shows the calculated k_{eff} values, and the differences to the casewith 50 skipped cycles. For all values, the table also shows the statistical uncertainty from the Monte Carlo calculation at a 95/95 percent level. This is two times the standard deviation for the calculated k_{eff} values, and two times the statistical combination of the individual standard deviations for the reactivity difference. Note that the uncertainties do not reduce with the number of skipped cycles, since the uncertainties depend on the number of active cycles which were kept at 100 for all calculations. The following conclusions can be drawn from the results:

- There is no clear trend in the results as a function of the skipped cycles: While the differences increase further when changing the number of inactive cycles from 100 to 200 for all four cases, they then reduce for 800 skipped cycles, becoming even negative for three of the four cases analyzed.

- 18 of the 20 differences are still within the band of values expected due to the statistical nature of the Monte Carlo evaluations. The remaining two values are just marginally outside of this band. The variations in the differences may therefore well be the result of the statistical uncertainty of the underlying calculations. Note that all maximum k_{eff} values listed in the Topical Report contain the contribution of the statistical uncertainty of the Monte Carlo calculations by including two times the standard deviation in the calculation of the uncertainties considered.

In summary, since there is no clear trend, and since the reactivity differences are essentially within the expected range based on the uncertainty of the underlying calculations, the initial calculations performed with 50 skipped cycles can be considered as adequate.

Table 09.01.01-25-1 – Sensitivity of k_{eff} Results Versus the Number of Skipped Cycles

Number of Skipped Cycles	Case			
	Region 1, Normal	Region 1, Accident, 400 ppm	Region 2, Normal, 4.0 wt% U-235 35 GWD	Region 2, Normal, 5.0 wt% U-235 50 GWD
	Calculated k_{eff} including uncertainty (95/95 level)			
50	0.9039±0.0014	0.8774±0.0016	0.9394±0.0014	0.9241±0.0012
100	0.9042±0.0016	0.8779±0.0016	0.9403±0.0012	0.9251±0.0012
200	0.9047±0.0016	0.8789±0.0014	0.9412±0.0012	0.9257±0.0012
400	0.9033±0.0016	0.8789±0.0014	0.9411±0.0012	0.9259±0.0012
800	0.9029±0.0016	0.8772±0.0014	0.9409±0.0014	0.9238±0.0014
	Difference in calculated k_{eff} (delta-k) to case with 50 skipped cycles, including uncertainty (95/95 level)			
50	Reference	Reference	Reference	Reference
100	0.0003±0.0021	0.0005±0.0023	0.0009±0.0018	0.0010±0.0017
200	0.0008±0.0023	0.0015±0.0023	0.0018±0.0017	0.0016±0.0017
400	-0.0006±0.0023	0.0015±0.0021	0.0017±0.0017	0.0018±0.0017
800	-0.0010±0.0023	-0.0002±0.0021	0.0015±0.0017	-0.0003±0.0017

FSAR Impact:

Neither the U.S. EPR FSAR nor Holtec Technical Report UN-TR-08-001(P) will be changed as a result of this question.