

KHNPDCDRAIsPEm Resource

From: Ciocco, Jeff
Sent: Monday, July 20, 2015 10:54 AM
To: apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; Harry (Hyun Seung) Chang; Yunho Kim; Christopher Tyree
Cc: Li, Zhian; Carlson, Donald; McKirgan, John; Wunder, George; Lee, Samuel
Subject: APR1400 Design Certification Application RAI 90-7939 (09.01.01 - Criticality Safety of Fresh and Spent Fuel Storage and Handling)
Attachments: APR1400 DC RAI 90 SRSB 7939.pdf; image001.jpg

KHNP,

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, KHNP requests, and we grant, 90 days to respond to the RAI question. We may adjust the schedule accordingly.

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

Jeff Ciocco
New Nuclear Reactor Licensing
301.415.6391
jeff.ciocco@nrc.gov



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From: Ciocco, Jeff

Created By: Jeff.Ciocco@nrc.gov

Recipients:

"Li, Zhian" <Zhian.Li@nrc.gov>
Tracking Status: None
"Carlson, Donald" <Donald.Carlson@nrc.gov>
Tracking Status: None
"McKirgan, John" <John.McKirgan@nrc.gov>
Tracking Status: None
"Wunder, George" <George.Wunder@nrc.gov>
Tracking Status: None
"Lee, Samuel" <Samuel.Lee@nrc.gov>
Tracking Status: None
"apr1400rai@khnp.co.kr" <apr1400rai@khnp.co.kr>
Tracking Status: None
"KHNPDCDRAIsPEM Resource" <KHNPDCDRAIsPEM.Resource@nrc.gov>
Tracking Status: None
"Harry (Hyun Seung) Chang" <hyunseung.chang@gmail.com>
Tracking Status: None
"Yunho Kim" <yshh8226@gmail.com>
Tracking Status: None
"Christopher Tyree" <Christopher.tyree@aeacom.com>
Tracking Status: None

Post Office: HQPWMSMRS08.nrc.gov

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REQUEST FOR ADDITIONAL INFORMATION 90-7939

Issue Date: 07/20/2015

Application Title: APR1400 Design Certification Review – 52-046

Operating Company: Korea Hydro & Nuclear Power Co. Ltd.

Docket No. 52-046

Review Section: 09.01.01 - Criticality Safety of Fresh and Spent Fuel Storage and Handling

Application Section:

QUESTIONS

09.01.01-1

RAI 9.1.1-1: Detailed description of the spent fuel burnup credit analysis method used in APR1400 design

10 CFR 50.68 prescribes fresh and spent fuel storage and handling system criticality safety requirements. General Design Criterion (GDC) 62 requires that criticality in the fuel storage and handling system be prevented by physical systems or processes, preferably by use of geometrically safe configurations.

The APR1400 DCD subsection 9.1.1 and technical report APR1400-Z-A-NR-14011-P, Rev. 0, titled "Criticality Analysis of New and Spent Fuel Storage Racks," state that the spent fuel pool rack design takes credit for burnup in spent fuel rack criticality safety analyses. Credit was taken for 28 isotopes, grouped into nine major actinides and 19 minor actinides and fission products.

In addition, on page 46 of APR1400-Z-A-NR-14011-P, Rev 0, the applicant refers to depletion uncertainty and the worth of minor actinides and fission products under specific ranges of applicability.

From these statements, it seems that the applicant used a mixture of the approaches provided in the Kopp Memo (Reference 11 of the technical report) and NUREG/CR-7109. However, it was not clear from the DCD or the technical report how these methods were used in the burnup credit analysis for the spent fuel rack. Because both the Kopp Memo and NUREG/CR-7109 treat modeling bias and bias uncertainties as a percentage of the base value of the corresponding reactivity reduction calculated from the depletion analysis code and criticality safety analysis code, the user of these methods must first determine the base values in the separate calculations. However, neither the DCD nor APR1400-Z-A-NR-14011-P, Rev. 0 provides a clear description on how the base values of reactivity reduction were determined. The applicant is requested to provide a clear description of the method it used in the spent fuel rack criticality safety analysis and demonstrate that the assumptions used and the results produced are conservative. Specifically, the applicant is requested to:

1. Explain how the reactivity reduction was determined for the fuel depletion. This explanation should include all assumptions used.
2. Explain how the base value of the burnup credit is determined for the 28 isotopes, including a description of the method (e.g., correction factor method, direct difference method, or a method beyond those presented in NUREG/CR-6811). If a method other than those presented in NUREG/CR-6811 is used, the applicant should provide a clear technical basis for the validity and reliability of the method.
3. If a mixture of approaches is being used, staff needs an explanation of how the Haut Taux de Combustion (HTC) data were used to benchmark the computer code(s).
4. Update the technical report and DCD as appropriate to clarify the items above.

The staff needs this information to determine if the APR1400 spent fuel rack design meets the regulatory requirements of 10 CFR 50.68 and GDC 62.

