

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 167-8191
SRP Section: 09.01.01 - Criticality Safety of Fresh and Spent Fuel Storage and Handling
Application Section:
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Question No. 09.01.01-12

RAI 9.1.1-18: Additional trending parameters for criticality code bias and uncertainty

REQUIREMENTS AND GUIDANCE

In 10 CFR Part 50 Appendix A, General Design Criterion (GDC) 62 requires the prevention of criticality in fuel storage and handling. 10 CFR 50.68(b) sets specific requirements for the demonstration of nuclear criticality prevention in fuel storage. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 9.1.1, guides the staff to review the computational method validation to verify that the validation study is thorough and uses benchmark critical experiments that are similar to the normal-conditions and abnormal conditions models and to verify that the neutron multiplication factor's bias and bias uncertainty values are conservatively determined.

ISSUE

The applicant's criticality validation report describes results from benchmarking the applicant's criticality code against sets of data from laboratory critical experiments performed on applicably similar water moderated arrangements of absorbers and arrayed fresh fuel rods of various uranium enrichments or mixed oxide compositions. The resulting code k-eff biases were statistically analyzed by the applicant against several postulated trending parameters with the conclusion that only uranium enrichment exhibits statistically significant bias and uncertainty trends. However, the trending parameters considered by the applicant did not include plutonium content or plutonium fission fraction. The NRC staff is aware of similar code validation benchmark studies that have found statistically significant trends against plutonium content. The staff is therefore concerned that applicant's determination of code bias and bias uncertainty has not conservatively addressed the code bias and uncertainty associated with plutonium effects.

INFORMATION NEEDED

In its response and in the DCD or its incorporated references, the applicant should provide a supplemental trending study of its experimental code benchmark results against plutonium content and/or code-computed plutonium fission fraction. If the applicant finds that the selected benchmarks with plutonium are too few for these purposes, then the applicant should state so and pursue additional benchmarks for addressing this issue. If supplemental trending results show statistically significant code bias trends against plutonium parameters such that more conservative bias and uncertainty adjustments would result, then the applicant should revise the code validation report accordingly and apply the resulting more conservative bias and uncertainty adjustments to its computed criticality results.

Response

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Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.