

KHNPDCDRAIsPEm Resource

From: Fringer, John
Sent: Tuesday, March 22, 2016 2:26 PM
To: apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; daegeun.ahn@gmail.com; jiyong.oh5@gmail.com; james.ross@aecom.com
Cc: Dixon-Herrity, Jennifer; Williams, Donna; Ciocco, Jeff; Palmrose, Donald; McCoppin, Michael; Hart, Michelle
Subject: APR1400 ER RAI 1-8429 (Environmental Report Review)
Attachments: APR1400 ER RAI 1-8429.pdf

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, the following RAI question response times. We may adjust the schedule accordingly.

28844 : 180days

28845 : 60days

28846 : 180days

28847 : 60days

28848 : 60days

28849 : 30days

28850 : 30days

28851 : 30days

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

Thank you,

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Sensitivity: Normal
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REQUEST FOR ADDITIONAL INFORMATION ER 1-8429

Issue Date: 03/22/2016

Application Title: APR1400 Design Certification Review – 52-046

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

Docket No. 52-046

Review Section: EIS ACC/SAMDA - Severe Accident Mitigation Design Alternatives

Application Section: APR1400 Environmental Report

QUESTIONS

EIS ACC/SAMDA-1

10 CFR 51.55(a) requires each applicant for a standard design certification under subpart B of 10 CFR Part 52 (i.e., 10 CFR 52.47(b)(2)) to submit with its application a separate document entitled, "Applicant's Environmental Report—Standard Design Certification." The environmental report must address the costs and benefits of severe accident mitigation design alternatives, and the bases for not incorporating severe accident mitigation design alternatives in the design to be certified.

The environmental standard review plan (ESRP) Section 7.3, Severe Accident Mitigation Alternatives, directs the staff to evaluate and independently confirm an applicant's severe accident mitigation design alternatives (SAMDA) analysis presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the technical report, "Severe Accident Mitigation Design Alternatives (SAMDA) for the APR1400," proprietary under ML15012A105 and non-proprietary under ML15009A246) that applies design and site information along with a cost-benefit analysis based on the guidance provided in NUREG/BR-0184. The scope includes the identification and evaluation of design alternatives and procedural modifications that reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment in the event that substantial core damage occurs (i.e., mitigating the impacts of a severe accident). The purpose of the review is to ensure that plant design changes with the potential for improved severe accident safety performance are identified and evaluated.

The staff requires the following additional information in order to complete its review of the environmental impacts of severe accidents and to ensure appropriate documentation of the applicant's assessment in the APR1400 Environmental Report.

Based on the justifications given in Table 4 under the column heading of Qualitative Screening, there appear to be upward of 39 potentially cost-beneficial SAMDAs. Provide additional documentation in Table 4 of APR1400-E-P-NR-14006-P with the basis as to why the costs are excessive or benefits negligible for certain SAMDAs and also clearly identify the specific SAMDAs that were not screened out. Clearly identify which SAMDAs were determined to need additional qualitative screening.

The NRC staff request that any revisions to the ER or supporting technical reports be provided as a markup as part of the response to this RAI.

This RAI is related to the Environmental Audit Information Needs ER-TI-12 (ML15198A023).

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EIS ACC/SAMDA-2

10 CFR 51.55(a) requires each applicant for a standard design certification under subpart B of 10 CFR Part 52 (i.e., 10 CFR 52.47(b)(2)) to submit with its application a separate document entitled, "Applicant's Environmental Report—Standard Design Certification." The environmental report must address the costs and benefits of severe accident mitigation design alternatives, and the bases for not incorporating severe accident mitigation design alternatives in the design to be certified.

The environmental standard review plan (ESRP) Section 7.3, Severe Accident Mitigation Alternatives, directs the staff to evaluate and independently confirm an applicant's severe accident mitigation design alternatives (SAMDA) analysis presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the technical report, "Severe Accident Mitigation Design Alternatives (SAMDA) for the APR1400," proprietary under ML15012A105 and non-proprietary under ML15009A246) that applies design and site information along with a cost-benefit analysis based on the guidance provided in NUREG/BR-0184. The scope includes the identification and evaluation of design alternatives and procedural modifications that reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment in the event that substantial core damage occurs (i.e., mitigating the impacts of a severe accident). The purpose of the review is to ensure that plant design changes with the potential for improved severe accident safety performance are identified and evaluated.

The staff requires the following additional information in order to complete its review of the environmental impacts of severe accidents and to ensure appropriate documentation of the applicant's assessment in the APR1400 Environmental Report.

Provide additional technical justification (i.e., the methodology and the source documents) for inclusion of each basic event discussed in Section 7 of APR1400-E-P-NR-14006-P as to why they should be considered as SAMDAs. While APR1400-E-P-NR-14006-P, Section 5, Identification of SAMDAs, describes the third source used to identify SAMDA items being from an importance analysis of the results from the APR1400 PRA analyses, no references or other documentation is provided. Additionally, while it is stated that each basic event with a Fussell-Vesely importance of greater than 0.5 percent was reviewed to identify any potential SAMDAs, no documentation is provided in the ER or in Section 7 of APR1400-E-P-NR-14006-P as to why this is appropriate to be applied for certain cutsets used for the importance analysis.

The response to this RAI also may need to be reflected in the DCD's FSAR Chapter 19.

The NRC staff request that any revisions to the ER or supporting technical reports be provided as a markup as part of the response to this RAI.

This RAI is related to the Environmental Audit Information Needs ER-TI-9 and ER-TI-10 (ML15198A023).

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EIS ACC/SAMDA-3

10 CFR 51.55(a) requires each applicant for a standard design certification under subpart B of 10 CFR Part 52 (i.e., 10 CFR 52.47(b)(2)) to submit with its application a separate document entitled, "Applicant's Environmental Report—Standard Design Certification." The environmental report must address the costs and benefits of severe accident mitigation design alternatives, and the bases for not incorporating severe accident mitigation design alternatives in the design to be certified.

The environmental standard review plan (ESRP) Section 7.3, Severe Accident Mitigation Alternatives, directs the staff to evaluate and independently confirm an applicant's severe accident mitigation design alternatives (SAMDAs) analysis presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the technical report, "Severe Accident Mitigation Design Alternatives (SAMDAs) for the APR1400," proprietary under ML15012A105 and non-proprietary under ML15009A246) that applies design and site information along with a cost-benefit analysis based on the guidance provided in NUREG/BR-0184. The scope includes the identification and evaluation of design alternatives and procedural modifications that reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment in the event that substantial core damage occurs (i.e., mitigating the impacts of a severe accident). The purpose of the review is to ensure that plant design changes with the potential for improved severe accident safety performance are identified and evaluated.

The staff requires the following additional information in order to complete its review of the environmental impacts of severe accidents and to ensure appropriate documentation of the applicant's assessment in the APR1400 Environmental Report.

Provide in the ER or supporting technical reports the baseline implementation cost in U.S. dollars for each SAMDA not screened out in ER Table 4 and for the basic events used to evaluate SAMDA benefit in Section 7 of APR1400-E-P-NR-14006-P, Rev0. ER Section 7.1 and 7.2 indicates that important basic events from at-power, and LPSD PRA events were reviewed and assessed for their maximum total benefit along with other events from the top 100 cutsets. However, the baseline cost along with justification for each potentially beneficial SAMDA is not presented in the ER or supporting technical reports. To properly compare the averted cost to the benefit of these potential SAMDAs, or related to important basic events, the specific implementation costs with documentation for each non-screened SAMDA and basic event needs to be provided.

The NRC staff request that any revisions to the ER or supporting technical reports be provided as a markup as part of the response to this RAI.

This RAI is related to the Environmental Audit Information Needs ER-TI-9 and ER-TI-11 (ML15198A023).

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EIS ACC/SAMDA-4

10 CFR 51.55(a) requires each applicant for a standard design certification under subpart B of 10 CFR Part 52 (i.e., 10 CFR 52.47(b)(2)) to submit with its application a separate document entitled, "Applicant's Environmental Report—Standard Design Certification." The environmental report must address the costs and benefits of severe accident mitigation design alternatives, and the bases for not incorporating severe accident mitigation design alternatives in the design to be certified.

The environmental standard review plan (ESRP) Section 7.3, Severe Accident Mitigation Alternatives, directs the staff to evaluate and independently confirm an applicant's severe accident mitigation design alternatives (SAMDA) analysis presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the technical report, "Severe Accident Mitigation Design Alternatives (SAMDA) for the APR1400," proprietary under ML15012A105 and non-proprietary under ML15009A246) that applies design and site information along with a cost-benefit analysis based on the guidance provided in NUREG/BR-0184. The scope includes the identification and evaluation of design alternatives and procedural modifications that reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment in the event that substantial core damage occurs (i.e., mitigating the impacts of a severe accident). The purpose of the review is to ensure that plant design changes with the potential for improved severe accident safety performance are identified and evaluated.

The staff requires the following additional information in order to complete its review of the environmental impacts of severe accidents and to ensure appropriate documentation of the applicant's assessment in the APR1400 Environmental Report.

Provide additional documentation in the ER or supporting technical reports to explain the purpose, need and development of Tables 5a through 5f and Tables 6a through 6f of APR1400-E-P-NR-14006-P. The discussion of these tables in Section 6 and 7 of APR1400-E-P-NR-14006-P is very brief (see pages 17 and 19) and does not provide a rationale as to how the information was developed, why each important basic event is being presented in the tables, and if there is any relationship to the Subsections 7.1 through 7.22 of APR1400-E-P-NR-14006-P.

The NRC staff request that any revisions to the ER or supporting technical reports be provided as a markup as part of the response to this RAI.

The response to this RAI also may need to be reflected in the DCD's FSAR Chapter 19.

This RAI is related to the Environmental Audit Information Needs ER-TI-13 (ML15198A023).

EIS ACC/SAMDA-5

10 CFR 51.55(a) requires each applicant for a standard design certification under subpart B of 10 CFR Part 52 (i.e., 10 CFR 52.47(b)(2)) to submit with its application a separate document

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entitled, "Applicant's Environmental Report—Standard Design Certification." The environmental report must address the costs and benefits of severe accident mitigation design alternatives, and the bases for not incorporating severe accident mitigation design alternatives in the design to be certified.

The environmental standard review plan (ESRP) Section 7.3, Severe Accident Mitigation Alternatives, directs the staff to evaluate and independently confirm an applicant's severe accident mitigation design alternatives (SAMDAs) analysis presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the technical report, "Severe Accident Mitigation Design Alternatives (SAMDAs) for the APR1400," proprietary under ML15012A105 and non-proprietary under ML15009A246) that applies design and site information along with a cost-benefit analysis based on the guidance provided in NUREG/BR-0184. The scope includes the identification and evaluation of design alternatives and procedural modifications that reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment in the event that substantial core damage occurs (i.e., mitigating the impacts of a severe accident). The purpose of the review is to ensure that plant design changes with the potential for improved severe accident safety performance are identified and evaluated.

The staff requires the following additional information in order to complete its review of the environmental impacts of severe accidents and to ensure appropriate documentation of the applicant's assessment in the APR1400 Environmental Report.

Provide documentation on the process that the expert panel followed and how they determined there are 29 APR1400 design-specific SAMDA items (see Section 5 of the ER and APR1400-E-P-NR-14006-P).

The NRC staff request that any revisions to the ER or supporting technical reports be provided as a markup as part of the response to this RAI.

This RAI is related to the Environmental Audit Information Needs ER-COM-3 (ML15198A023).

EIS ACC/SAMDA-6

10 CFR 51.55(a) requires each applicant for a standard design certification under subpart B of 10 CFR Part 52 (i.e., 10 CFR 52.47(b)(2)) to submit with its application a separate document entitled, "Applicant's Environmental Report—Standard Design Certification." The environmental report must address the costs and benefits of severe accident mitigation design alternatives, and the bases for not incorporating severe accident mitigation design alternatives in the design to be certified.

The environmental standard review plan (ESRP) Section 7.3, Severe Accident Mitigation Alternatives, directs the staff to evaluate and independently confirm an applicant's severe accident mitigation design alternatives (SAMDAs) analysis presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the technical report, "Severe Accident Mitigation

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Design Alternatives (SAMDA) for the APR1400,' proprietary under ML15012A105 and non-proprietary under ML15009A246) that applies design and site information along with a cost-benefit analysis based on the guidance provided in NUREG/BR-0184. The scope includes the identification and evaluation of design alternatives and procedural modifications that reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment in the event that substantial core damage occurs (i.e., mitigating the impacts of a severe accident). The purpose of the review is to ensure that plant design changes with the potential for improved severe accident safety performance are identified and evaluated.

The staff requires the following additional information in order to complete its review of the environmental impacts of severe accidents and to ensure appropriate documentation of the applicant's assessment in the APR1400 Environmental Report.

Provide the source document(s) and the pages in these documents for the approximately 540 SAMDA items from the PRA results. Section 5 of the ER and APR1400-E-P-NR-14006-P mentioned the PRA for APR1400 as the third information source used to identify SAMDA items. However, no references are provided in Section 5 and in Tables 5a through 5f as to which PRA documents is the source for this information.

The NRC staff request that any revisions to the ER or supporting technical reports be provided as a markup as part of the response to this RAI.

This RAI is related to the Environmental Audit Information Needs ER-COM-4 (ML15198A023).

EIS ACC/SAMDA-7

10 CFR 51.55(a) requires each applicant for a standard design certification under subpart B of 10 CFR Part 52 (i.e., 10 CFR 52.47(b)(2)) to submit with its application a separate document entitled, "Applicant's Environmental Report—Standard Design Certification." The environmental report must address the costs and benefits of severe accident mitigation design alternatives, and the bases for not incorporating severe accident mitigation design alternatives in the design to be certified.

The environmental standard review plan (ESRP) Section 7.3, Severe Accident Mitigation Alternatives, directs the staff to evaluate and independently confirm an applicant's severe accident mitigation design alternatives (SAMDA) analysis presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the technical report, "Severe Accident Mitigation Design Alternatives (SAMDA) for the APR1400,' proprietary under ML15012A105 and non-proprietary under ML15009A246) that applies design and site information along with a cost-benefit analysis based on the guidance provided in NUREG/BR-0184. The scope includes the identification and evaluation of design alternatives and procedural modifications that reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment in the event that substantial core damage occurs (i.e., mitigating the impacts of a severe accident). The purpose of the review is to ensure that plant design changes with the potential for improved severe accident safety

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performance are identified and evaluated.

The staff requires the following additional information in order to complete its review of the environmental impacts of severe accidents and to ensure appropriate documentation of the applicant's assessment in the APR1400 Environmental Report.

For APR1400-E-P-NR-14006-P, Rev0, provide documentation showing all of the subsections in Section 7 are cited to a SAMDA in Table 4 or to a basic event in Table 5.

The NRC staff request that any revisions to the ER or supporting technical reports be provided as a markup as part of the response to this RAI

This RAI is related to the Environmental Audit Information Needs ER-CON-1 (ML15198A023).

EIS ACC/SAMDA-8

10 CFR 51.55(a) requires each applicant for a standard design certification under subpart B of 10 CFR Part 52 (i.e., 10 CFR 52.47(b)(2)) to submit with its application a separate document entitled, "Applicant's Environmental Report—Standard Design Certification." The environmental report must address the costs and benefits of severe accident mitigation design alternatives, and the bases for not incorporating severe accident mitigation design alternatives in the design to be certified.

The environmental standard review plan (ESRP) Section 7.3, Severe Accident Mitigation Alternatives, directs the staff to evaluate and independently confirm an applicant's severe accident mitigation design alternatives (SAMDAs) analysis presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the technical report, "Severe Accident Mitigation Design Alternatives (SAMDAs) for the APR1400," proprietary under ML15012A105 and non-proprietary under ML15009A246) that applies design and site information along with a cost-benefit analysis based on the guidance provided in NUREG/BR-0184. The scope includes the identification and evaluation of design alternatives and procedural modifications that reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment in the event that substantial core damage occurs (i.e., mitigating the impacts of a severe accident). The purpose of the review is to ensure that plant design changes with the potential for improved severe accident safety performance are identified and evaluated.

The staff requires the following additional information in order to complete its review of the environmental impacts of severe accidents and to ensure appropriate documentation of the applicant's assessment in the APR1400 Environmental Report.

Describe how and whether the ER and SAMDA analysis will be updated to reflect changes to plant systems, configurations, and the APR1400 design. Specify how the ER and SAMDA analysis will be updated to reflect subsequent information developed during the DC review (i.e., updates to the APR1400 DCD and PRA information and insights).