
REVISED 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.: ER 1-8428
SRP Section: Environmental Report
Application Section: APR1400 Environmental Report
Date of RAI Issued: 03/22/2016

Question No. EIS ACC/SA-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 7.2, Severe Accidents, of NUREG 1555 directs the staff to evaluate and independently confirm severe accident risks and analyses presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the proprietary technical report, "Severe Accident Mitigation Design Alternatives (SAMDAs) for the APR1400," under ML15012A105) of accidents involving radioactive material that can be postulated for the plant under review. The scope of this review should include probability-weighted consequence (i.e., risks) analysis for severe accidents, including dose and socioeconomic risk impacts based on plant specific data in sufficient detail to appropriately evaluate the risks for severe accidents.

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 justification why the use of an older version of the SecPop computer code, which is based on Census 2000 data (SecPop2000), should be acceptable for supporting the severe accident analysis when Census 2010 data is readily available via the latest version of SecPop (SecPop v4.3).

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-4 (ML15198A023).

Response – (Rev.1)

The original sensitivity analysis showed that though there was an increase in dose and costs associated with the use of SECPOP (2010) population data, the percent difference of the overall impact is nearly negligible and would not change any conclusion presented in the APR1400 Level 3 analysis or SAMDA analysis, as documented in the original analysis. The results and analyses presented in the original analysis remained valid.

The revised Level 3 analysis (APR1400-E-P-NR-14006-P, Rev. 1) is using SEPOP 4.3 which uses the 2010 Census data directly. There is no population sensitivity case in the revised Level 3 analysis. Additionally, population projections have changed significantly on a county level, so the population growth factors and 2030 estimates included in the previous version are no longer applicable.

Previously, a sensitivity analysis was performed on the original Level 3 analysis to project population growth between 2000 to 2010 then again from 2010 to 2030.

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

The SAMDA Report is revised as described in the response.

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Question No. EIS ACC/SA-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 7.2, Severe Accidents, of NUREG 1555 directs the staff to evaluate and independently confirm severe accident risks and analyses presented in an Environmental Report (ER) (i.e., the APR1400 ER, "Applicant's Environmental Report – Standard Design Certification," found under ML15006A038 and the proprietary technical report, "Severe Accident Mitigation Design Alternatives (SAMDA) for the APR1400," under ML15012A105) of accidents involving radioactive material that can be postulated for the plant under review. The scope of this review should include probability-weighted consequence (i.e., risks) analysis for severe accidents, including dose and socioeconomic risk impacts based on plant specific data in sufficient detail to appropriately evaluate the risks for severe accidents.

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.

The staff requires additional information on the information taken from the Level 2 PRA analysis to be used as input to the severe accident consequence analyses for each of the event categories (internal and low-power/shutdown (LPSD)) and source term categories (STC01 to STC21) in order to determine the reasonable expected total offsite risk calculations.

- a. Provide separate results and information from the Level 2 PRA on each of the containment releases (i.e., source terms/release fractions) for internal events, internal fire, internal flooding, LPSD internal events, LPSD fire, and LPSD flooding.

- b. Discuss how the fission product groups from the Level 2 PRA MAAP calculations were mapped into the fission product groups for MACCS input.
- c. Provide and discuss the basis for the release plume segments for each source term category which were applied in in each event category.
- d. Provide the MACCS results for each event category.

It appears from the information provided in Tables 2a through 2f and Tables 3a through 3f, the same offsite consequence results were applied regardless of the event category (i.e., internal events, internal fire, internal flooding, LPSD internal events, LPSD fire, and LPSD flooding). Namely, the release fractions given on pages A9 through A19 (note, no table number is provided for this information) appear to be the only one applied in all MACCS calculations and Reference 7 of Appendix A was not provided in the DC application. However, it is expected that the source term information and plume segments for each event category would not be the same from the Level 2 PRA, especially for LPSD events.

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-2 (ML15198A023).

Response – (Rev.1)

- a. As summarized in Section 2 of the Source Term Analysis notebook, APR1400-K-P-NR-013603-P, Revision 2, and described in detail in Section 4 of that document, the source term characteristics for a given source term category (STC), e.g., radionuclide release fractions and timing, are independent of the initiating event or hazard category that caused the at-power accident sequence. Therefore, separate STC information for atpower accident sequences initiated by internal fire or internal flooding events is neither developed nor required.

Evaluation of the STC for the LPSD PRA is documented in APR1400-K-P-NR-013762-P, Revision 0. In that analysis, the STCs developed for LPSD were shown to be similar to at-power STCs in release timing and radionuclide release.

Because the at-power and LPSD STCs are similar in characteristics, only one set of STCs is needed for the LPSD Level 3 PRA analysis. Given that the STCs are developed based on phenomenological considerations, it is expected that results for atpower and LPSD STCs are the same.

- b. Mapping of the fission product groups from MAAP to MACCS was added to [attachment 1 of APR1400-K-P-NR-013901-P Revision 1](#). Reference to [that document is provided in the Section 3 of SAMDA Report \(APR1400-E-P-NR-014006-P, Rev. 1\)](#) as follows:

This information is then used to approximate the radiological release plumes used in the Level 3 analysis. The Level 3 analysis uses the MACCS code while the Level 2 PRA used the MAAP code to develop fission product releases. Mapping of

the MAAP fission product release categories to the MACCS fission product release categories is shown in Reference 9. Also, shown in Reference 9 is the basis and development of the plume segments for input to the MACCS code.

- c. Development of plume segments for the Level 3 PRA was added to [attachment 1 of APR1400-K-P-NR-013901-P Revision 1](#). [Reference to that document is provided in the SAMDA Report \(APR1400-E-P-NR-014006-P, Rev. 1\) as shown](#) in the response to Part b.
- d. As discussed in the response to Part a, the STC results are the same for all event categories. Therefore, separate MACCS results are neither developed nor required for different event categories.

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

[The SAMDA Report is updated to reflect the changes discussed above.](#)