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.:	**377-8487**
SRP Section:	**11.02 – Liquid Waste Management System**
Application Section:	**11.02**
Date of RAI Issue:	**01/28/2016**

Question No. 11.02-10

REQUIREMENT: 10 CFR 50, APPENDIX I

GUIDANCE: RG 1.109

ISSUE: NRC staff reviewed the information provided in RAI 123-7920 response (9/14/2015, ML15278A149), to verify 10 CFR 50 Appendix I compliance. NRC staff confirmatory calculations are unable to verify the data provided for the irrigated food pathways. When performing the confirmatory analysis the staff originally observed values 100 times greater than those reported in the LADTAP output files provided by the applicant and the values provided in DCD Table 11.2-5. In the RAI 7920 response the applicant confirmed that there was indeed an error with consumption values and acknowledged that the consumption values in the input deck were not positioned correctly. The applicant has specified that they have corrected these values to the intended values of 520 kg for adults, 630 kg for teens, and 520 kg for children. However, staff notes that in the newly provided LADTAP input file the applicant uses the values found in in RG 1.109, Table E-5 for the “Fruits, vegetables & grain” pathway for all of the irrigated food pathways (vegetables, leafy vegetables, milk, and meat pathways).

1) NRC staff requests the applicant to confirm the values being reported in the LADTAP input and output files and results being reported in DCD Table 11.2-5. The staff also asks the applicant to provide a justification for the use of RG 1.109 Table E-5 values for “Fruits, vegetables & grain” for the Leafy vegetables, milk, and meat pathways and to provide a DCD table within DCD 11.2 to provide further clarification on the consumption values to be used by the applicant.

Additionally, the applicant’s response to RAI 7920 stated:

“The irrigation rate of 16.67 L/m^2-month (0.5 m/yr) used in the LADTAP II calculation is based on a document titled “Data collection handbook to support modeling impacts of radioactive material in soil”, Argonne National Laboratory, 1993. This document provides the definitions and values

that can be used in RESRAD code analysis. In Section 11.3 of the document, the default value for the irrigation rate is 0.2 m/yr, which represents the conditions of a relatively humid region. For LADTAP II code calculation, a conservative value of 0.5 m/yr was selected."

2) NRC staff notes that Table 11.2-4 in the DCD states the irrigation rate was 41.68 L/m^2-month. Please provide which is the correct value, either 16.67 or 41.68, and explain why it is the correct value.

Please address these items and provide a markup for the proposed DCD changes.

Response - (Rev.1)

1) KHNP confirms the use of the data in RG 1.109 Table E-5 for the vegetables, leafy vegetable, milk, meat, fish, drinking water and shoreline recreation pathways as the default values for LADTAP II computer code run. These parameters are used as they are the recommended values for the maximum exposed individual in lieu of site-specific data. Based on the above clarification, KHNP confirms that the LADTAP II results are reported in DCD Table 11.2-5. In DCD Table 11.2-4 it is stated that other parameters which include consumption values are from RG 1.109. Consumption values which used in the calculation will be added in DCD Table 11.2-4.

2) KHNP confirms that the irrigation rate of 41.68 L/m^2-month is correct. The LADTAP II calculation uses an irrigation rate of 41.68 L/m^2- month (0.5 m/yr). The 0.5 m/yr value is selected based on the referenced document (Reference 36): "Data collection handbook to support modeling impacts of radioactive material in soil", Argonne National Laboratory, 1993. This reference suggests an irrigation efficiency of 50% when there is no site-specific information on the annual average irrigation rate.

Impact on DCD

DCD Tier 2 Table 11.2-4 will be updated as indicated in Attachment.

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.

Table 11.2-4 (1 of 2)

Input Parameters Used for LADTAP II Code

Parameter	Value	Basis
Water type selection	Freshwater	Assumed that the liquid effluents are discharged to river or lake
Liquid effluent discharge rate (L/min)	3.79×10^{4}	See description in Subsection 11.2.3.1
Shore-width factor	0.2	Table A-2 in RG 1.109
Reconcentration model index	0	Assumed that there is no reconcentration
Source terms	See Table 11.2-1	Based on PWR-GALE code calculation
Dilution factor for aquatic food and boating	5	For DC application, a conservative dilution factor of 5.0 is assumed for evaluating individual doses from liquid effluents.
Dilution factor for shoreline and swimming	5	
Dilution factor for drinking water	5	
Dilution factor for irrigation water usage location for the current food product	5	
Irrigation rate ($L/m^2 \cdot month$)	41.68	Average value (0.5 m/yr) used in RESRAD code analysis (Reference 36)
Fraction of animal feed not produced with contaminated irrigation water	0	Assumed for conservative evaluation
Fraction of animal drinking water not obtained from contaminated irrigation water	0	
Transit time for any exposure pathway	0	
Midpoint of plant life (years)	30	Half of the APR1400 design life of 60 years
Other parameters	Default values in RG 1.109	Since there is no site-specific information for DC application, default values in RG 1.109 are used.

Table E-5

Table 11.2-4 (2 of 2)

Pathway	Infant	Child	Teen	Adult
Fruits, vegetables & grain (kg/yr)	-	520	630	520
Leafy vegetables (kg/yr)	-	26	42	64
Milk (L/yr)	330	330	400	310
Meat & Poultry (kg/yr)	-	41	65	110
Fish (fresh or salt) (kg/yr)	-	6.9	16	21
Drinking water (L/yr)	330	510	510	730
Shoreline recreation (hr/yr)	-	14	67	12