
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.: 361-8431
SRP Section: 11.02 – Liquid Waste Management System
Application Section: 11.02
Date of RAI Issue: 01/11/2016

Question No. 11.02-9

In review of DCD section 11.2 the staff requests the applicant add a DCD table to demonstrate compliance with 10 CFR 50 Appendix I, Section II.A. Section II.A requests the applicant to demonstrate:

“The calculated annual total quantity of all radioactive material above background¹ to be released from each light-water-cooled nuclear power reactor to unrestricted areas will not result in an estimated annual dose or dose commitment from liquid effluents for any individual in an unrestricted area from all pathways of exposure in excess of 3 millirems to the total body or 10 millirems to any organ.”

The staff acknowledges the discussion in DCD section 11.2.3.1 to state the compliance with the dose objectives. However the staff requests a table demonstrating compliance in section 11.2 similar to Table 11.3-7 (sheet 1 of 3) for consistency with the DCD section 11.3.

Please address the item above and provide a mark-up on the proposed DCD changes.

Response - (Rev. 1)

As requested, doses to total body and any organ will be added as a summary table in Table 11.2-5. The highest doses to total body and any organ among adult, teen, child and infant are selected based on the calculated results in Table 11.2-5. The highest dose to total body is from adult and the dose to any organ is from child liver.

Doses from liquid effluents were recalculated in the response to RAI 123-7920 Question 11.01-3. Doses will be revised and the annual dose limit will be added to Table 11.2-5.

Impact on DCD

DCD Tier 2 Table 11.2-5 will be updated as indicated in the 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.

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Insert 'A'

Table 11.2-5 (1 of 2)

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replace with B

~~Individual Doses from Liquid Effluents (mSv/yr)~~

Age Group	Skin	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Fish								
ADULT	-	1.54E-02	1.53E-02	1.12E-02	3.37E-04	5.14E-03	1.77E-03	4.47E-03
TEEN	-	1.65E-02	1.57E-02	6.62E-03	2.89E-04	5.20E-03	2.02E-03	3.29E-03
CHILD	-	2.08E-02	1.37E-02	2.99E-03	2.76E-04	4.38E-03	1.60E-03	1.30E-03
Drinking								
ADULT	-	2.07E-04	6.68E-03	6.61E-03	6.85E-03	6.53E-03	6.44E-03	7.55E-03
TEEN	-	1.98E-04	4.77E-03	4.63E-03	4.89E-03	4.63E-03	4.55E-03	5.35E-03
CHILD	-	5.71E-04	9.18E-03	8.80E-03	9.60E-03	8.90E-03	8.73E-03	9.47E-03
INFANT	-	5.93E-04	9.14E-03	8.60E-03	9.97E-03	8.75E-03	8.58E-03	9.03E-03
Shoreline Activity								
ADULT	2.13E-05	1.81E-05	1.81E-05	1.81E-05	1.81E-05	1.81E-05	1.81E-05	1.81E-05
TEEN	1.19E-04	1.01E-04	1.01E-04	1.01E-04	1.01E-04	1.01E-04	1.01E-04	1.01E-04
CHILD	2.48E-05	2.12E-05	2.12E-05	2.12E-05	2.12E-05	2.12E-05	2.12E-05	2.12E-05
Irrigated food: Vegetables								
ADULT	-	4.12E-06	5.01E-05	4.88E-05	4.84E-05	4.72E-05	4.55E-05	6.65E-05
TEEN	-	6.85E-06	6.34E-05	5.86E-05	6.00E-05	5.86E-05	5.59E-05	8.22E-05
CHILD	-	1.63E-05	1.01E-04	9.02E-05	9.73E-05	9.31E-05	8.86E-05	1.09E-04
Irrigated food: Leafy Vegetables								
ADULT	-	4.12E-06	5.01E-05	4.88E-05	4.84E-05	4.72E-05	4.55E-05	6.65E-05
TEEN	-	6.85E-06	6.34E-05	5.86E-05	6.00E-05	5.86E-05	5.59E-05	8.22E-05
CHILD	-	1.63E-05	1.01E-04	9.02E-05	9.73E-05	9.31E-05	8.86E-05	1.09E-04
Irrigated food: Milk								
ADULT	-	2.78E-06	4.93E-05	4.81E-05	4.71E-05	4.64E-05	4.54E-05	4.52E-05
TEEN	-	4.65E-06	6.20E-05	5.78E-05	5.82E-05	5.73E-05	5.58E-05	5.52E-05
CHILD	-	1.11E-05	9.89E-05	8.93E-05	9.37E-05	9.09E-05	8.83E-05	8.72E-05

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Table 11.2-5 (2 of 2)

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Age Group	Skin	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Irrigated Food: Meat								
ADULT	-	8.86E-06	4.65E-05	4.71E-05	4.59E-05	6.02E-05	4.51E-05	5.44E-04
TEEN	-	1.52E-05	5.75E-05	5.77E-05	5.63E-05	8.12E-05	5.53E-05	6.93E-04
CHILD	-	3.74E-05	9.13E-05	9.23E-05	8.99E-05	1.32E-04	8.76E-05	5.97E-04
Sum of All Pathways								
ADULT	2.13E-05	1.56E-02	2.22E-02	1.80E-02	7.39E-03	1.19E-02	8.41E-03	1.28E-02
TEEN	1.19E-04	1.68E-02	2.08E-02	1.16E-02	5.51E-03	1.02E-02	6.89E-03	9.65E-03
CHILD	2.48E-05	2.15E-02	2.33E-02	1.22E-02	1.03E-02	1.37E-02	1.07E-02	1.17E-02
INFANT	0.00E+00	5.93E-04	9.14E-03	8.60E-03	9.97E-03	8.75E-03	8.58E-03	9.03E-03

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A

Table 11.2-5 (1 of 3)

Maximum Offsite Individual Dose Resulting
from Normal Plant Liquid Releases

Type of Dose	Estimated Dose
Dose to total body (mSv/yr)	1.80E-02
Dose to any organ (mSv/yr)	2.33E-02

B(1/2)

Table 11.2-5 (1 of 2)

Individual Doses from Liquid Effluents (mrem/yr)

Type of Dose	Estimated Dose	Annual Dose Limit
Dose to total body (mSv/yr)	2.76E+00	3.00E+00
Dose to total skin (mSv/yr)	1.19E-02	1.00E+01
Dose to any organ (mSv/yr)	4.05E+00	1.00E+01

B(2/2)

Table 11.2-5 (2 of 2)

Age Group	Skin	Bone	Liver	T.body	Thyroid	Kidney	Lung	GI-LLI
Fish								
ADULT	-	1.54E+00	1.53E+00	1.12E+00	3.37E-02	5.14E-01	1.77E-01	4.47E-01
TEEN	-	1.65E+00	1.57E+00	6.62E-01	2.89E-02	5.20E-01	2.02E-01	3.29E-01
CHILD	-	2.08E+00	1.37E+00	2.99E-01	2.76E-02	4.38E-01	1.60E-01	1.30E-01
Drinking								
ADULT	-	2.07E-02	6.68E-01	6.61E-01	6.85E-01	6.53E-01	6.44E-01	7.55E-01
TEEN	-	1.98E-02	4.77E-01	4.63E-01	4.89E-01	4.63E-01	4.55E-01	5.35E-01
CHILD	-	5.71E-02	9.18E-01	8.80E-01	9.60E-01	8.90E-01	8.73E-01	9.47E-01
INFANT	-	5.93E-02	9.14E-01	8.60E-01	9.97E-01	8.75E-01	8.58E-01	9.03E-01
Shoreline Activity								
ADULT	2.13E-03	1.81E-03	1.81E-03	1.81E-03	1.81E-03	1.81E-03	1.81E-03	1.81E-03
TEEN	1.19E-02	1.01E-02	1.01E-02	1.01E-02	1.01E-02	1.01E-02	1.01E-02	1.01E-02
CHILD	2.48E-03	2.12E-03	2.12E-03	2.12E-03	2.12E-03	2.12E-03	2.12E-03	2.12E-03
Irrigated food : Vegetables								
ADULT	-	4.02E-02	4.99E-01	4.86E-01	4.58E-01	4.70E-01	4.54E-01	6.56E-01
TEEN	-	6.67E-02	6.31E-01	5.83E-01	5.63E-01	5.84E-01	5.58E-01	8.11E-01
CHILD	-	1.59E-01	1.01E+00	8.99E-01	8.98E-01	9.28E-01	8.84E-01	1.08E+00
Irrigated food : Leafy vegetables								
ADULT	-	5.07E-03	6.17E-02	6.00E-02	5.92E-02	5.81E-02	5.60E-02	8.17E-02
TEEN	-	4.56E-03	4.23E-02	3.90E-02	3.97E-02	3.91E-02	3.73E-02	5.47E-02
CHILD	-	8.13E-03	5.06E-02	4.51E-02	4.82E-02	4.66E-02	4.43E-02	5.43E-02
Irrigated food:Milk								
ADULT	-	1.65E-02	2.94E-01	2.87E-01	2.78E-01	2.76E-01	2.71E-01	2.69E-01
TEEN	-	2.94E-02	3.93E-01	3.67E-01	3.65E-01	3.63E-01	3.54E-01	3.50E-01
CHILD	-	6.99E-02	6.27E-01	5.66E-01	5.84E-01	5.76E-01	5.60E-01	5.53E-01
Irrigated food : Meat								
ADULT	-	1.79E-02	9.82E-02	9.94E-02	9.53E-02	1.26E-01	9.54E-02	1.11E+00
TEEN	-	1.50E-02	5.92E-02	5.94E-02	5.68E-02	8.27E-02	5.70E-02	6.90E-01
CHILD	-	2.82E-02	7.19E-02	7.26E-02	6.89E-02	1.03E-01	6.90E-02	4.55E-01
Sum of all Pathways								
ADULT	2.13E-03	1.64E+00	3.15E+00	2.72E+00	1.61E+00	2.10E+00	1.70E+00	3.32E+00
TEEN	1.19E-02	1.80E+00	3.18E+00	2.18E+00	1.55E+00	2.06E+00	1.67E+00	2.78E+00
CHILD	2.48E-03	2.40E+00	4.05E+00	2.76E+00	2.59E+00	2.98E+00	2.59E+00	3.22E+00
INFANT	0.00E+00	5.93E-02	9.14E-01	8.60E-01	9.97E-01	8.75E-01	8.58E-01	9.03E-01