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## 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.: 147-7933  
SRP Section: 11.03 – Gaseous Waste Management System  
Application Section: 11.03 – Gaseous Waste Management System  
Date of RAI Issue: 08/10/2015

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### **Question No. 11.03-2**

DCD Table 11.3-5 provides information related to the analyses which are done to show compliance with the 10 CFR 50 Appendix I dose objectives. To evaluate this information, the staff performed confirmatory calculations for gaseous effluents using the GASPARD information provided by the applicant and were unable to duplicate the values for Ground dose, Inhalation doses for Adult, and Inhalation doses for Teenager. In the current revision of the DCD the applicant provides an output file that supports the ground doses described in DCD Table 11.3-7 in the DCD, but the provided output file does not support the inhalation doses for Adult and Teenager pathways provided in DCD Table 11.3-7.

In the technical review of the data produced by GASPARD for DCD Table 11.3-7 the staff found that there are two sets of meteorological data being used. One set of meteorological data is referenced in DCD Table 2.0-1 for the Exclusion Area Boundary (EAB), and the second set of meteorological data found in DCD Table 11.3-7 is not referenced at all in DCD section 2.3.5.

DCD Table 11.3-5 provides a basis for the input parameters used for GASPARD II Code stating “Assumed that in food production area,  $\chi/Q$  will be reduced by half due to the distance from the site boundary.” The staff is unable to support this statement since the possibility of food production existing at the site boundary within resident gardens, meat animals, and milk producing animals as likely receptors.

In accordance with 10 CFR 50 Appendix I the staff requests the following information:

1. The  $\chi/Q$  values used to determine gaseous effluent doses for food production animals be evaluated and values provided that are referenced in section 2.3.5, for Long-Term Atmospheric Dispersion Estimates for Routine Gaseous Effluent Releases.
2. Resolve the inconsistency with the data provided in the application and provided the data provided in the form of GASPARD output files and those numbers provided in DCD Table 11.3-7 for Ground Dose, Adult Inhalation Doses, and Teenager Inhalation Doses.

3. Provide a calculation package that further justifies the use of specific parameters for the GASPARG code by providing the basis for all design parameters and values used in the GASPARG code calculation.

Please address the items above and provide a mark-up on the proposed DCD

### **Response**

1. The long-term  $\chi/Q$  value provided in DCD Table 2.0-1 is  $2.0E-05 \text{ sec/m}^3$ . In the GASPARG calculation, this value is used to evaluate the offsite doses for plume, ground deposition and inhalation pathways. However, for the doses due to food intake pathways, the  $\chi/Q$  value of  $1.0E-05 \text{ sec/m}^3$  is used. This value is derived by reducing  $2.0E-05 \text{ sec/m}^3$  by half considering the anticipated distance from site boundary to the food production areas. Since the  $\chi/Q$  value is site-specific and includes a high level of uncertainty during the DC application phase, this value for APR1400 DC is intended to envelop more than the 90th percentile of the long-term  $\chi/Q$  values in U.S. NPP sites. Due to the limited publicly available information on the long-term  $\chi/Q$  values for all U.S. NPP sites, the values for the following six (6) NPPs (see Table 1) were investigated and it was found that selection of  $1.0E-5 \text{ sec/m}^3$  enveloped the 96 percentile of the six sites.

Table 1. Annual Average  $\chi/Q$  Values for Several U.S. Nuclear Power Plants

U.S. Plant	EAB Distance (m)	$\chi/Q$ ( $\text{sec/m}^3$ )
Ginna	500	$1.10E-05$
D.C. COOK	610	$1.13E-05$
Point Beach	1200	$1.39E-06$
Kewaunee	1200	$1.2E-06$
San Onofre	600	$8.7E-06$
Braidwood	610	$1.9E-06$

As indicated on DCD Page 11.3-25 and COL Item 11.3(7), the COL applicant will perform a site-specific offsite dose calculation using the meteorological data measured at the corresponding site. If the site-specific long-term  $\chi/Q$  value used for the food intake pathway exceeds  $1.0E-05 \text{ sec/m}^3$ , then the COL applicant will be able to take proper measures to meet the dose limits in 10 CFR 50 Appendix I, including adjustment of the distance to the site boundary.

2. Inconsistency between the data provided in the GASPARG output files and the doses for Adult and Teen age groups from inhalation pathway in DCD Table 11.3-7 will be corrected.
3. For the GASPARG II Code calculation, as explained in DCD Table 11.3-5, all the input parameter values were obtained from the default values in RG 1.109 except for the atmospheric dispersion factors and expected radioactivity release rates. Description on

the  $\chi/Q$  values are provided in Response to Item No. 1 of this question. The electronic input and output files of GASPAR code run were submitted to NRC during the APR1400 DC acceptance review phase and were not revised after then.

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**Impact on DCD**

DCD Table 11.3-7 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 Environmental Reports.

## APR1400 DCD TIER 2

Table 11.3-7 (2 of 3)

	Total Body	GI Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume	3.47E-03							5.53E-02
Ground	3.19E-04	3.19E-04	3.19E-04	3.19E-04	3.19E-04	3.19E-04	3.19E-04	3.74E-04
Vegetable								
Adult		5.03E-03	2.46E-02	4.97E-03	4.92E-03	1.15E-02	4.86E-03	
Teen		7.75E-03	3.88E-02	7.72E-03	7.64E-03	1.57E-02	7.56E-03	
Child		1.77E-02	9.19E-02	1.78E-02	1.77E-02	3.28E-02	1.76E-02	
Meat								
Adult		1.70E-03	7.84E-03	1.66E-03	1.66E-03	1.93E-03	1.65E-03	
Teen		1.40E-03	6.61E-03	1.38E-03	1.37E-03	1.57E-03	1.37E-03	
Child		2.55E-03	1.24E-02	2.55E-03	2.54E-03	2.85E-03	2.54E-03	
Goat milk								
Adult		2.18E-03	9.07E-03	2.43E-03	2.29E-03	1.23E-02	2.18E-03	
Teen		3.77E-03	1.66E-02	4.21E-03	3.97E-03	1.99E-02	3.78E-03	
Child		8.67E-03	4.06E-02	9.46E-03	9.04E-03	4.11E-02	8.71E-03	
Infant		1.75E-02	7.82E-02	1.92E-02	1.82E-02	9.64E-02	1.77E-02	
Inhalation								
Adult		7.33E-04	1.39E-05	7.35E-04	7.39E-04	1.32E-03	7.41E-04	
Teen		7.40E-04	1.69E-05	7.44E-04	7.49E-04	1.52E-03	7.54E-04	