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.:	**20-7912**
SRP Section:	**02.03.04 - Short Term Atmospheric Dispersion Estimates for Accident Releases**
Application Section:	**2.3**
Date of RAI Issued:	**06/01/2015**

Question No. 02.03.04-1

As stated in SRP Section 2.3.4, 10CFR50 Appendix A, GDC 19 provides the requirements related to the meteorological considerations used to evaluate the personnel exposures inside the control room during radiological and airborne hazardous material accident conditions.

SRP Section 2.3.4 Acceptance Criteria 5 states, in part, that atmospheric dispersion factors used for the assessment of consequences related to atmospheric radioactive releases to the control room for design basis, other accidents, and for onsite and offsite releases of hazardous airborne materials should be provided.

So that the staff may independently conduct a confirmatory analysis to verify the technical acceptability per NRC Regulatory Guide 1.194, please provide the input and output files for all source/receptor pairs in the ARCON96 analysis. These files should be in native (ASCII) format so that the staff may conduct a confirmatory analysis.

Response

The onsite atmospheric dispersion factors used for control room habitability analysis are evaluated using APR1400 design-specific source-receptor design parameters and the meteorological data for Prairie Island during the time period from 1993 to 1997. These values are then adjusted to include a margin of 50% and the reduction factors allowed by RG 1.194. Table 1 shows the names of ARCON96 input and output files used for the calculations and the relevant information such as source and receptor locations, adjustment factors and the corresponding table numbers in the DCD. The input and output files for all source/receptor pairs in the ARCON96 analysis are provided in ASCII text format in Attachment 1. In addition, the typographic errors found in Tables 2.3-4 and 2.3-5 will be updated as indicated in Attachment 2.

Table 1. ARCON96 I/O Filenames and the Relevant Information

No.	ARCON96 I/O File Name	Release Points (Source)	Intake Points (Receptor)	Margin	Reduction Factor*	Table No. in DCD
1	MSNCNIPI	Main Steam Valve Room North Vent	MCR North Intake	1.5	8	2.3-4
2	MSSCSIPI	Main Steam Valve Room South Vent	MCR South Intake	1.5	8	2.3-4
3	MSNCSIPI	Main Steam Valve Room North Vent	MCR South Intake	1.5	8	2.3-5
4	MSSCNIPI	Main Steam Valve Room South Vent	MCR North Intake	1.5	8	2.3-5
5	CBCNI	Containment Building (CB) Surface	MCR North Intake	1.5	8	2.3-2
6	CBCSI		MCR South Intake	1.5	8	2.3-2
7	CBMCRCL		MCR Roof Centerline	1.5	8	2.3-2
8	CBABNI	Containment Building (CB) Surface	Auxiliary Building North Intake	1.5	2	2.3-3
9	CBABSI		Auxiliary Building South Intake	1.5	2	- **
10	MSNABNI	Main Steam Valve Room North Vent	Auxiliary Building North Intake	1.5	2	- **
11	MSSABSI	Main Steam Valve Room South Vent	Auxiliary Building South Intake	1.5	2	2.3-6
12	ADVNCNI	Atmospheric Dump Valve North Vent	MCR North Intake	1.5	8	2.3-7
13	ADVSCSI	Atmospheric Dump Valve South Vent	MCR South Intake	1.5	8	2.3-7
14	MSSNCNI	Main Steam Safety Valve North Vent	MCR North Intake	1.5	8	2.3-8
15	MSSSCSI	Main Steam Safety Valve South Vent	MCR South Intake	1.5	8	2.3-8
16	ABNVCNI	Auxiliary Building North Vent	MCR North Intake	1.5	8	2.3-9
17	ABNVCSI		MCR South Intake	1.5	8	2.3-9
18	ABSVCNI	Auxiliary Building South Vent	MCR North Intake	1.5	8	2.3-10
19	ABSVCSI		MCR South Intake	1.5	8	2.3-10
20	ABSVABNI	Auxiliary Building South Vent	Auxiliary Building North Intake	1.5	2	- **

No.	ARCON96 I/O File Name	Release Points (Source)	Intake Points (Receptor)	Margin	Reduction Factor*	Table No. in DCD
21	ABSVABSI		Auxiliary Building South Intake	1.5	2	2.3-11
22	FBVCNI	Fuel Handling Area Vent	MCR North Intake	1.5	8	2.3-12
23	FBVCSI		MCR South Intake	1.5	8	2.3-12

Note)

* A factor of 2 is applied for Auxiliary Building intakes since the two intakes are located in a different wind direction window per RG 1.194, Section 3.3.2.2, Equation 6a. A factor of 10 is applied to account for the ability to automatically select a "clean" MCR intake per RG 1.194, Section 3.3.2.4, but for the conservatism, a factor of 8 is used.

** For the Auxiliary Building intakes, only the limiting values are listed in the DCD tables.

Question No. 02.03.04-2

As stated in SRP Section 2.3.4, 10CFR52.47(a)(2)(iv) provides the requirements with respect to an assessment of the plant design features intended to mitigate the radiological consequences of accidents, which includes consideration of postulated site meteorology, to evaluate the offsite radiological consequences at the EAB and LPZ.

SRP Section 2.3.4 Acceptance Criteria 2 states, in part, that meteorological data used for the evaluation (as input to the dispersion models) which represent annual cycles of hourly values of wind direction, wind speed, and atmospheric stability for each mode of accidental release should be provided.

APR1400, Tier 2, Table 2.3-13 (1 of 6) lists Prairie Island as the meteorological data used for the design input for the ARCON96 calculations. So that the staff may independently conduct a confirmatory analysis to verify the technical acceptability per NRC Regulatory Guide 1.194, please provide the Prairie Island (1993-1997) meteorological data that was used for the ARCON96 analysis. This data may be submitted in either RG 1.23 format or ARCON format.

Response

The meteorological data for Prairie Island (1993-1997) used for the onsite χ/Q calculations are provided in Attachment 3.

Question No. 02.03.04-3

As stated in SRP Section 2.3.4, 10CFR52.47(a)(2)(iv) provides the requirements with respect to an assessment of the plant design features intended to mitigate the radiological consequences of accidents, which includes consideration of postulated site meteorology, to evaluate the offsite radiological consequences at the EAB and LPZ.

SRP Section 2.3.4 Acceptance Criteria 1 states, in part, that a description of the atmospheric dispersion models used to calculate χ/Q values for accidental releases of radioactive and hazardous materials to the atmosphere should be provided. The models should be documented in detail and substantiated within the limits of the model so that the staff can evaluate their appropriateness of use with regards to release characteristics, plant configuration, plume density, meteorological conditions, and site topography.

So that the staff may independently conduct a confirmatory analysis to verify the technical acceptability per NRC Regulatory Guide 1.145, please provide the input and output files used for the analysis of the Accident Release χ/Q Values at the Site Boundary, as provided in Table 2.0-1 (2 of 4). If no input and output files exist, please provide a description of how these χ/Q Values were derived.

Response

Since the site-specific meteorological conditions are not available in the design certification (DC) application stage, the accident χ/Q values for APR1400 were selected to bound the recommended values in EPRI URD and the other previous DC applications. Therefore, no specific calculation using site-specific meteorological data was conducted.

Table 2 compares the accident χ/Q values at the EAB and LPZ used in radiological consequence analyses for the APR1400 with the values for other DC applications and Volume II, Chapter 1, Table 1.2-6 in the EPRI URD. As shown in Table 2, the accident χ/Q values used for the APR1400 are bounding the other values.

However, the COL applicant is to estimate the short-term accident χ/Q values using the site-specific meteorological data as indicated in COL 2.3(1) and to confirm if the site-specific χ/Q values exceed the bounding values described in Tables 2.3-1 of the DCD as specified in COL 2.3(2) in Subsection 2.3.6.

Table 2. Comparison of APR1400 Accident χ/Q Values With Other DC Applications and EPRI-URD

Receptor Location	Time Interval (hr)	χ/Q (sec/m^3)				
		AP1000	US-EPR	US-APWR	EPRI-URD	APR1400
EAB	0-2	5.1E-04	1.00E-03	5.0E-04	1.00E-03	1.00E-03
LPZ	0-2	2.2E-04	1.75E-04	2.1E-04	1.35E-04	2.20E-04
	2-8		1.35E-04			
	8-24	1.6E-04	1.00E-04	1.3E-04	1.00E-04	1.60E-04
	24-96	1.0E-04	5.40E-05	6.9E-05	5.4E-05	1.00E-04
	96-720	8.0E-05	2.20E-05	2.8E-05	2.2E-05	8.00E-05
Annual Average		2.0E-05	4.973E-06	1.6E-05	N/A	2.00E-05

Impact on DCD

Table 2.3-4 and 2.3-5 in DCD will be revised as indicated in Attachment 2.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical and Environmental Reports.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Table 2.3-4

Onsite χ/Q for North and South Main Steam Valve Room
Direct Releases to MCR North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m^3)	
	North Main ~~Stream~~ Valve Room to MCR North Intake	South Main ~~Stream~~ Valve Room to MCR South Intake
0–2	2.68E-03	5.63E-03
2–8	2.10E-03	4.43E-03
8–24	9.17E-04	1.93E-03
24–96	6.38E-04	1.29E-03
96–720	5.06E-04	1.01E-03

Table 2.3-5

Onsite χ/Q for North and South Main Steam Valve Room
Cross Releases to MCR North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m^3)	
	North Main ~~Stream~~ Valve Room to MCR South Intake	South Main ~~Stream~~ Valve Room to MCR North Intake
0–2	2.33E-04	2.57E-04
2–8	1.32E-04	2.10E-04
8–24	5.48E-05	9.21E-05
24–96	3.58E-05	5.79E-05
96–720	2.72E-05	4.54E-05