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.:	**2-7828**
SRP Section:	**02.05.02 – Vibratory Ground Motion**
Application Section:	**2.5.2**
Date of RAI Issued:	**04/13/2015**

Question No. 02.05.02-1

Section 2.5 and Subsections 2.5.2.1 through 2.5.2.6 detail information needed in a COL application referencing the APR1400 DCD, but in those sections there is no reference to the appropriate NRC Regulatory Guides that explain in detail the contents of a COL application and the performance-based approach used to define the site-specific ground motion.

In accordance with Appendix S to 10 CFR Part 50, regarding Section 2.5 and subsections therein, please clarify the NRC Regulatory Guides that are applicable to Section 2.5 and Subsections 2.5.2.1 through 2.5.2.6 and propose associated APR1400 DCD modifications.

Response

The text of the Subsection 2.5.2 will be revised to clarify that the probabilistic seismic hazard analysis (PSHA) and ground motion response spectra (GMRS) will be evaluated following the approach recommended by NRC RG 1.208. Subsection 2.5.6 will be also revised to explain the contents of a COL application for the GMRS.

Impact on DCD

DCD sections 2.5.2, 2.5.6 and Table 1.8-2 will be revised as indicated on the attached markup.

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.

2.5 Geology, Seismology, and Geotechnical Engineering

The combined license (COL) applicant is to provide site-specific information on geology, seismology, and geotechnical engineering as required in NRC RG 1.206 (Reference 1) and described below (COL 2.5(1)). The site-specific information includes the geological, seismological, geophysical, and geotechnical investigations and evaluations procedures to estimate the site-specific ground motion response spectra (GMRS), as well as the geotechnical engineering aspects of the site and slope stability.

2.5.1 Basic Geologic and Seismic Information

Geological, seismological, geophysical, and geotechnical characteristics of the region within 320 km (200 mi) of the site are described. The details of the investigations are increased as the radius of the investigation decreases. The site characteristics based on the investigation results are described in accordance with U.S. Nuclear Regulatory Commission (NRC) Regulatory Guides (RGs) 1.206, 1.132, 1.138, and 1.208 (References 1 through 4, respectively).

2.5.2 Vibratory Ground Motion

Information to determine the site-specific GMRS and to compare the GMRS to the seismic design response spectra for the APR1400 is described. The design spectra for the APR1400 referred to as the certified seismic design response spectra (CSDRS) are presented in Figures 3.7.1-1 and 3.7.1-2.

The APR1400 is evaluated for hard rock high frequency (HRHF) input using the response spectra specified in Subsection 3.7.1.

The site-specific GMRS is developed using the PSHA results based on the performance based approach recommended in NRC RG 1.208 (Reference 4) and is described at the stage of COL application(COL 2.5(1)).

2.5.2.1 Seismicity

A complete list of historically reported earthquakes is included in the site-specific data. The list includes earthquakes of Modified Mercalli Intensity (MMI) greater than or equal to IV or a magnitude greater than or equal to 3.0 reported within 320 km (200 mi) of the site. Large earthquakes outside the area that could affect the SSE are included.

The design criteria used in the stability studies of all safety-related facilities including a description of the computer programs used in the analyses and the soil loads are described.

2.5.4.12 Techniques to Improve Subsurface Conditions

If necessary to improve subsurface conditions, the plans, summaries of specifications, and methods of quality control will be described in the site-specific information.

2.5.5 Stability of Slopes

No assumptions in regard to slope stability are used in the evaluation of the APR1400 standard design.

The stability of all natural and manmade slopes, including embankments and dams, that are vital to the safety of APR1400 are included in site-specific information.

2.5.6 Combined License Information

The COL applicant is to conduct the probabilistic seismic hazard analysis (PSHA) and develop the site-specific GMRS using the PSHA results as required in NRC RG 1.208.

COL 2.5(1) The combined license (COL) applicant is to provide the site-specific information on geology, seismology, and geotechnical engineering as required in NRC RG 1.206 ~~(Reference 1)~~.

COL 2.5(2) The COL applicant is to confirm that the site-specific GMRS transferred to the bottom elevation of the nuclear island are completely enveloped by the CSDRS-compatible free-field response motions at the bottom elevation of the nuclear island for a site with the low-strain shear wave velocity greater than 304.8 m/s (1,000 ft/s) at the finished grade in the free field. Alternately, the COL applicant is to confirm that the site-specific GMRS at the bottom elevation of the nuclear island are completely enveloped by the CSDRS for a hard rock site with a low-strain shear wave velocity of supporting medium for the nuclear island greater than 2,804 m/s (9,200 ft/s).

COL 2.5(3) The COL applicant is to confirm that the lower bound of the site-specific strain-compatible soil profile for a soil site is greater than the lower bound of the generic strain-compatible soil profiles used in the APR1400 seismic analyses.

The COL applicant is to conduct the probabilistic seismic hazard analysis (PSHA) and develop the site-specific GMRS using the PSHA results as required in NRC RG 1.208.

Table 1.8-2 (2 of 29)

Item No.	Description
COL 2.5(1)	The COL applicant is to provide the site-specific information on geology, seismology, and geotechnical engineering as required in NRC RG 1.206.
COL 2.5(2)	The COL applicant is to confirm that the foundation input response spectra (FIRS) of the nuclear island are completely enveloped by the CSDRS-compatible free-field response motions at the bottom elevation of the nuclear island for a site with the low-strain shear wave velocity greater than 304.8 m/s (1,000 ft/s) at the finished grade in the free field. Alternately, the COL applicant is to confirm that FIRS of the nuclear island are completely enveloped by the CSDRS for a hard rock site with a low-strain shear wave velocity of supporting medium for the nuclear island greater than 2,804 m/s (9,200 ft/s).
COL 2.5(3)	The COL applicant is to confirm that the lower bound of the site-specific strain-compatible soil profile for a soil site is greater than the lower bound of the generic strain-compatible soil profiles used in the APR1400 seismic analyses.
COL 2.5(4)	The COL applicant is to confirm that the site-specific GMRS determined at the finished grade are completely enveloped by the hard rock high frequency (HRHF) response spectra for a site with a low-strain shear wave velocity of supporting medium for the nuclear island higher than 1,494 m/s (4,900 ft/s) overlaying a hard rock with a low-strain shear wave velocity greater than 2,804 m/s (9,200 ft/s).
COL 2.5(5)	The COL applicant is to perform a site-specific seismic analysis to generate in-structure response spectra at key locations using the procedure described in Appendix 3.7A if COL 2.5(2) and COL 2.5(3) above are not met. In addition, the COL applicant is to confirm that the site-specific in-structure response spectra so generated are enveloped by the corresponding in-structure response spectra provided in Appendix 3.7A.
COL 2.5(6)	The COL applicant is to perform a site-specific seismic response analysis using the procedure described in Appendix 3.7B and the EPRI White Paper, “Seismic Screening of Components Sensitive to High Frequency Vibratory Motions,” if COL 2.5(4) is not met.
COL 2.5(7)	The COL applicant is to perform an evaluation of the subsurface conditions within the standard plant structure footprint based on the geologic investigation in accordance with NRC RG 1.132.
COL 2.5(8)	The COL applicant is to confirm that the dynamic properties of structural fill granular to be used in construction of the APR1400 seismic Category I structures satisfy the requirements of structural fill granular provided in Table 2.0-1.
COL 3.2(1)	The COL applicant is to identify the seismic classification of site-specific SSCs that should be designed to withstand the effects of the SSE.
COL 3.2(2)	The COL applicant is to identify the quality group classification of site-specific systems and components and their applicable codes and standards.
COL 3.3(1)	The COL applicant is to demonstrate that the site-specific design wind speed is bounded by the design wind speed of 64.8 m/s (145 mph).
COL 3.3(2)	The COL applicant is to demonstrate that the site-specific seismic Category II structures adjacent to the seismic Category I structures are designed to meet the provisions described in Subsection 3.3.1.2.
COL 3.3(3)	The COL applicant is to provide reasonable assurance that site-specific structures and components not designed for the extreme wind loads do not impact either the function or integrity of adjacent seismic Category I SSCs.