Staff Feedback on KHNP Responses to RAI Question 3.7.1-4, -6, and -7

1   Generic Soil Profiles in APR1400 DCD (RAI 3.7.1-4)

APR1400 DCD and technical reports have descriptions of low-strain soil profiles and strain-compatible soil profiles. The applicant's response to RAI 182-8160, Question 01.07.01-4 further clarifies that the low-strain P-wave velocities were used in the SSI analyses related to the CSDRS and HRHF RS inputs. The strain-compatible shear wave velocities were used in all SSI analyses. Based on the DCD, technical reports, and the RAI response, the staff understands which soil profiles were used as generic soil profiles in the DCD SSI analyses.

However, since strain compatible soil profiles are applicable only to COL applications pertaining to their specific sites, the DCD needs only to make sure that a COL applicant compare its strain-compatible soil profiles with DCD generic soil profiles. To make this concept clear in the DCD, the applicant is requested to revise the DCD to use the term "generic soil profiles" to refer the soil profiles used in the DCD SSI analyses, not strain-compatible shear wave velocities or low-strain P-wave velocities, and keep only the generic soil profiles in Tables 3.7A-1 through 3.7A-9. For the HRHF input motion, DCD Section 3.7B.3, High Frequency Site Profiles, should be enhanced to include only the generic soil profile used in the HRHF SSI analysis, and include a table or add a column to Table 3.7A-9 for the HRHF generic soil profile. This change may affect DCD Section 2.5 regarding the HRHF generic soil profile.

1.1   Staff Feedback on KHNP Response to RAI 3.7.1-4:

Although the RAI response generally addressed the RAI questions, the staff finds that the proposed markup to the APR1400 DCD does not reach a sufficient level of clarity in the DCD regarding the DCD generic soil profiles and how they compare to COL strain-compatible soil profiles. The revised DCD still uses terms such as "low-strain", "strain-compatible", and "generic" when describing soil profiles. It also describes site response analysis to consider modulus reduction and hysteretic damping curves. Therefore, the staff requests the applicant to expand the revision of the DCD Sections 3.7 and Appendices 3.7A and 3.7B to describe only generic soil profiles. The revision should also remove the description of site response analysis and degradation models in the context of DCD, while the newly added COL 3.7(11) and COL 3.7(12) should remain (with minor change). Associated with the requested revision of the DCD, the applicant should ensure that technical reports **APR1400-E-S-NR-14001-P Rev. 0** and APR1400-E-S-NR-14004-P Rev. 1 to have description indicating which soil profiles in the reports become the DCD generic soil profiles.

Other reasons for the requested revision of the DCD include:

1. to leave the determination of "strain-compatible" P-wave velocities to the purview of COLA because DCD need only to describe generic P-wave velocities,
2. to be consistent with other certified standard designs, and
3. to avoid confusion and improve efficiency for future COL and DC applications .

Two examples of suggested changes to the DCD are provided below, which are highlighted in yellow:

COL 3.7(12), "the COL applicant …with ~~strain-compatible~~ generic soil properties…"

DCD Section 3.7.1.2, "Damping values of soil to be used in soil-structure interaction analysis are ~~obtained from generic modulus reduction and hysteretic damping curves recommended by EPRI TR-102293 (reference 11) based on site response analysis of soil columns for the standard plant profiles considering shear strain computability~~ provided in Tables 3.7A-1 through 3.7A-9."

1.2   Staff feedback on Draft Revised RAI Response, submitted on 4/6/2016

From 2/24/26 Bi-weekly meeting minutes: The NRC staff stated that the response was nearly acceptable as-is; however, it was requested that TeR APR1400-E-S-NR-14001 be revised to state what soil profile(s) are used as DCD generic soil profiles, as has been done in TeR APR1400-E-S-NR-14004. KHNP stated that the response would be revised.

RAI response and markups are acceptable and can be finalized.