Questions in Response to RAI 8089, Question 03.11-11

1. In the response, KHNP proposes adding a new Appendix 3A to APR1400-E-X-NR-14001-P, however, currently the DCD references the September 2014 version of APR1400-E-X-NR-14001-P, which does not include this newly added appendix. The applicant must ensure that the modifications to APR1400-E-X-NR-14001-P are appropriately referenced in the DCD.

2. In several places in the response, the applicant mentions a revised DCD Table 3.11-3 and revised Table 3 of APR1400-E-X-NR-14001-P, however, these revised tables were not included in the response. Please indicate when they will be provided.

3. In the response to Question 5.b, the applicant indicates that TIDs from filter loading in the CRE ACUs are not specifically analyzed because they are bounded by the ABCAEEACUs. However, these filters are in different parts of the building and the ABCAEEACUs. Are the CRE ACUs considered to have the same loading as the ABCAEEACUs? If not, the ABCAEEACUs appear to be in a radiologically harsh environment during accident conditions for EQ purposes, meaning that it is radiologically significant for EQ purposes. Therefore, it doesn't appear to make sense to ignore the CRE ACUs simply because the ABCAEEACUs have a higher dose rate. Please provide better justification in the response for why the TIDs from filter loadings in the CRE ACUs are not specifically analyzed.

<u>The remaining questions are all regarding the proposed markup to APR1400-E-X-NR-14001-P (Attachment 2 in the response).</u>

4. In Section 3A.1.1, the first paragraph indicates that the components inside containment within the scope of the EQ program are the CS/SC and SI systems. However, this does not include the safety-related radiation monitors inside containment or any other safety-related components inside containment. Please update the statement appropriately and include the radiation monitors in the updates DCD Table 3.11-3 and Table 3 of APR1400-E-X-NR-14001-P.

5. In Section 3A.1.1, under the definition of "Release Source Term," it states that the core inventory release fractions for each radionuclide group at the gap release and early in-vessel release phases for the LOCA are listed in DCD Table 15A-2." However, DCD Table 15A-2 only lists the gap phase. Please include the correct table(s) in this sentence.

6. In Section 3A.1.1 under IRWST Source term and in the DCD markup of Section 15.6.5.5.1.2, it states that the initial source term in the IRWST consists of 40% halogens in the core inventory, 30% of alkali metal, and small fractions of other fission products. Isn't this source term the same source term provided in Table 12.2-24, in the response to RAI 8247, Question 12.02-16? If so, why not include a reference to this table with this

information or at a minimum, at least specify the fractions of the “other fission products,” because a “small fraction” is too vague. If this is not the same source term as the proposed Table 12.2-24, please explain why a different IRWST source term is being used.

7. In Section 3A.1, the applicant indicates that the dose rate was calculated at the containment atmosphere, containment wall surface, bottom of containment, and in the center of the containment IRWST sump. However, the markup does not specify why these locations were chosen and how the doses from these four locations were used to come up with the TID for components in containment (for example, were all four doses added to come up with a TID value to be used for all components in containment, or how were the individual dose rates assigned to specific equipment).

8. Section 3A.2.1, under “ESF Components Leakage,” it states that the maximum anticipated leakage rate through all ESF system components containing the IRWST water source term (i.e., SI/SC/CS components) is calculated to be 0.285 ft^3/hour and that the value of 0.285 ft^3/hour (2.13 gal/hour) was doubled, in accordance with RG 1.183 to a value of 0.57 ft^3/hour (4.26 gal/hour). This value was also stated in Section 3A.2.2.2. However, the value of 2.13 gal/hour in DCD Table 15.6.5-13, was updated to 10 gal/hour in the response to RAI 8213, Question 15.00.03-29 (ML15301A901). Therefore, in accordance with RG 1.183 and the response to Question 15.00.03-29, the correct assumption for ESF Component Leakage would be 2.674 ft^3/hour (20 gal/hour). Please update the ESF Component Leakage rate in Section 3A.2.1 and the associated calculations accordingly. Also, please ensure that other information referenced in the response is based on current information.

9. In Section 3A.2.1, under “Partition Coefficient,” the applicant assumes that the partition factor is 10% for halogens, while RG 1.183, Appendix A, Section 5.4, indicates that if the leakage exceeds 212 degrees Fahrenheit, that the equation in Section 5.4 should be used to calculate the partition coefficient. It is only assumed to be 10% if the fluid is less than 212 degrees Fahrenheit or if the value calculated is less than 10%. However, DCD Table 15.6.5-13 shows that containment sump fluid, post-LOCA, is above 212 degrees Fahrenheit. Therefore, please justify the use of the 10% value for halogens or update the partition coefficient accordingly.

10. Also under “Partition Coefficient” in Section 3A.2.1, it reads as if the partition coefficients are only used for calculating the amount that goes into the ABCAEES. Please verify that the partition coefficients are also used for calculating airborne activity inside the Auxiliary Building. If so, specify this under “Partition Coefficient,” if not, please indicate what partition coefficients were used for calculating the airborne activity source term.

11. In Section 3A.2.1, under “SI/SC/CS Piping geometry”, it indicates that Schedule 40S steel pipe and nominal pipe size of 16-inch are assumed for conservatism. However, DCD Table 6.8-4 indicates that there is SI piping as large as 24-inches. 24 inch pipe

would result in a larger dose rate, that 16 inch pipe. Therefore, please explain why 16 inches is considered conservative.

12. In Section 3A.2.2.1, on the very last line of Page (7/30), it specifies that the relative concentration of the plume is 6.725×10^{-4} sec/m^3. Please specify how this value was derived.

13. Editorial error, on the very first line of page 8/30, it states that the ABCAEES intake flow rate is 1.02×10^4 m^3hr. The units should be m^3/hr.

14. In Section 3A.2.2.2 (titled Airborne Activity and Filter Loading Dose due to SI/SC/CS Leakage), regarding SI/SC/CS leakage, it states that the airborne Iodine radioactivity in cubicles of the Auxiliary Building is released to the environment via the ABCAEES filter. In addition, Figure 3A-7 indicates that radioactivity being released to the environment is accounted for in the calculation. However, for determining the doses for equipment qualification purposes, RG 1.183, Appendix I, Paragraph 13 specifies that the filter media should be assumed to be 100% efficient for iodine and particulates, meaning that there would be no radioactivity release, outside of containment, for the purposes of calculating equipment qualification dose. Therefore, for Auxiliary Building leakage, please clarify what efficiency is being assumed for the filters and what amount of radioactivity is being released (not accumulated in the filters). If the efficiency for Iodine and particulates are different than 100%, please justify the values used.

15. In Section 3A.3.1, under “Fuel Handling Area,” the applicant indicates that the removal efficiency of the carbon absorbers is assumed to be 100%. Are the HEPA filters also assumed to be 100%, consistent with RG 1.183? If so, please state this in this section. If not, please indicate what value is assumed for the HEPA filters and justify the value used.

16. Section 3A.4 specifies that the main steam valve house source term for equipment qualification purposes is based on a main steam line break. Please indicate if a steam generator tube rupture was considered for this analysis and specify why a main steam line break was chosen.

17. On page 5/30, it states that the containment inner diameter is 75 feet. However, in Table 3A-1, for ISOSHLD inputs, it indicates in multiple places that a radius of 2290 centimeters (75 feet) was used. Please make sure the response is accurate and consistent regarding whether the radius or diameter of the inside of containment is 75 feet and ensure that all calculations were performed using the correct value.

18. The proposed markup is unclear and appears inconsistent regarding the assumptions used for airborne activity in the Auxiliary Building. First on page 3/30, it specifies that the RUNT-G and ISOSHLD codes run as one computer program. On page 6/30, under “ABCAEES Envelope Areas,” it states that for the RUNT-G model the Auxiliary Building

controlled areas I and II are assumed to be one area having a volume of 497,000 ft^3 (which seems small for the entire Auxiliary Building Controlled Area). Then on note 2 of Table 3A-2 (ISOSHLD Input Parameters for Airborne Activity in Auxiliary Building), it states that the volume of 170,000 ft^3 is assumed as a conservative bounding volume, because ESF system rooms range from 7820 ft^3 to 32,300 ft^3. However, it is not just the ESF systems for which airborne activity needs to be considered (there is other safety-related equipment required to be qualified beside just ESF systems) and a higher volume should lower the airborne concentration because the activity would become more dispersed. Please clarify what is being modeled for calculating airborne activity in the Auxiliary Building and explain why what is being assumed is accurate or conservative. Also please ensure that the response and report are accurate.

19. In Section 3A.1.2, it specifies that radioactive decay and sub-sequent daughter products were considered, however, this section is only applicable to inside containment. Please update the markup to clearly specify if radioactive decay and sub-sequent daughter products were considered for calculations outside containment, as well.