1. Low Power Shutdown (LPSD)

   a. In design control document (DCD) Section 19.1.6, and internal fire an internal flooding probabilistic risk assessment (PRA) for LPSD is not developed for the APR1400 design certification (DC). These risks are evaluated qualitatively for LPSD by assuming sufficient quadrant separation and that the fire and flooding analyses are bounded by full power operation. This approach is technically deficient since the qualitative evaluation does not evaluate or discuss the risk impact of breached fire barriers or flood barriers at LPSD. Also, this qualitative analysis does not evaluate LPSD specific initiators like fire induced hot shorts that could cause over-drain of the reactor coolant system (RCS). At shutdown, when the steam generators are unavailable, availability of alternating current (AC) electrical power for RCS injection pumps becomes more risk significant. Fire induced losses of the AC power and switchyard can become risk significant. Due to this issue, the risk evaluation results for this subject area are also not complete.

      **(Response)** The LPSD internal fire and flooding PRA are qualitatively discussed in Section 19.1.6. KHNP will reconsider the bounding assumption discussed in Section 19.1.6, and provide an expanded evaluation as necessary. The expanded evaluation will cover the topics such as the risk impact of breached fire barriers or flood barriers at LPSD, LPSD specific initiators like fire induced hot shorts that could cause over-drain of the RCS, the fire induced losses of the AC power and switchyard, etc.. However, KHNP would like to clarify acceptable technical approach for the internal fire and flooding PRA.

   b. In DCD Section 19.1.6, a Level 2 PRA for LPSD is not developed for the APR1400 DC. Therefore, large release frequency (LRF) is not quantitatively evaluated for LPSD operation. The LRF is evaluated qualitatively for LPSD, with insights from screening calculations, using the LPSD core damage frequency (CDF) results. In this qualitative evaluation of LRF, the DCD states that the conditional containment failure probability (CCFP) uses a screening value of 1.0 for plant operational states in which the equipment hatch can be open, and a value of 0.1 otherwise. However, Table 19.1-106 in the APR1400 DCD shows CCFP of 0.1 for plant operational states where no technical specifications (TS) apply for containment closure, and the DCD assumes the containment is closed or open with a recovery credit of 0.9.

      This approach is technically deficient since the feasibility for containment closure is not evaluated given the time to RCS boiling, assuming a loss of decay heat removal and necessary human actions. In addition to the feasibility of containment closure per GL 88-17 (which is essential for estimating LRF at LPSD), the need for hydrogen control for the containment to remain intact following a severe accident is not evaluated. The applicant does credit TS 3.9.3 for containment closure which only applies during CORE ALTERATIONS and not reduced inventory conditions. Assuming 1) no TS for containment closure in Modes 5 and 6 during reduced inventory, 2) no justification for the containment closure recovery credit, and 3) no evaluation of the need to control hydrogen, the LRF would be equal to CDF, which exceeds the Commission's goal of less than 1E-6/yr for LRF. Due to this issue, the risk evaluation results for this subject area are also not complete. Lastly, capability for containment to provide at least one

integral barrier to the release of radioactive fission products following a severe accident at shutdown is not evaluated. To resolve this issue, the applicant would have to evaluate the feasibility for containment closure and the need for hydrogen control during LPSD.

**(Response)** Level 2 PRA for LPSD is described in Section 19.1.6.3. KHNP will provide an expanded evaluation of the Level 2 PRA for LPSD, which is currently based on a qualitative evaluation. The expanded evaluation will consider performing a quantitative evaluation that includes the feasibility for containment closure per GL 88-17 and the need for hydrogen control during LPSD.

2. Risk Insights

The list of PRA risk insights and key assumptions (which are associated with many design aspects and features described in several chapters of the DCD) is not sufficiently developed for the APR1400 DC and lacks disposition to relevant sections of the DCD. For example, an important risk insight not cited in DCD Chapter 19 is the use of fiber optic cables between the main control room safety console, the group controllers, and loop controllers, thereby minimizing the impact from fire induced spurious hot shorts.

These risk insights and key assumptions are also used to help identify additional TIER 1 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) information.

**(Response)** KHNP will provide an updated list of PRA insights and key assumptions that are dispersed throughout Chapter 19 in a single location that includes the disposition to relevant sections of the DCD. The updated list will be rechecked to ensure that any additional items from the list are appropriately reflected in TIER 1 ITAAC information.

3. COL Actions Items

DCD Chapter 19 defines only four COL action items. Also, statements are made throughout DCD Chapter 19 regarding activities that the COL applicant will perform. However, these are not defined as COL action Items. Also, there are additional COL action items that need to be identified (e.g., COL action item for COL applicant to verify the seismic as-built High Confidence of Low Probability of failure).

**(Response)** KHNP would like to discuss a preferred method of documenting the COL action items associated with DCD Chapter 19 (i.e., detailed specific COL action items or high level COL action items that encompass the specific COL action items), and will implement the COL action items based on the preferred method.